



# Arenac County

2021

# Hazard Mitigation Plan

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**ACKNOWLEDGEMENTS**

Funded with assistance of FEMA through the Pre-Disaster Mitigation Grant Program



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**Plan Adopted by the Arenac County Board of Commissioners:**

April 20, 2021



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**&**

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# Chapter 1

# *Introduction*



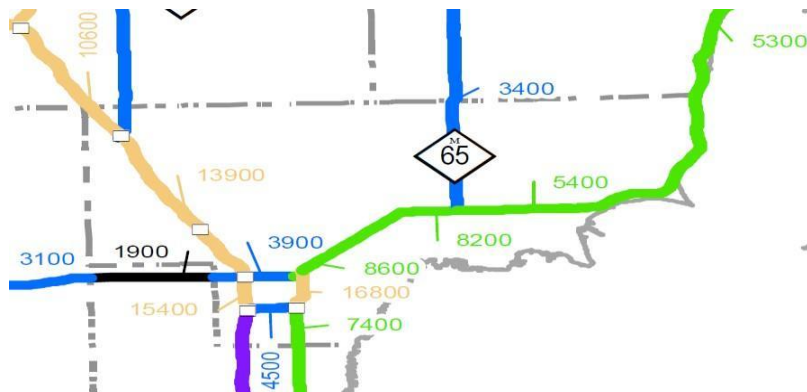
**Arenac County** is in the east mid-section of the lower peninsula of Michigan situated on the Saginaw Bay of Lake Huron. The County is bordered to the north by both Iosco and Arenac Counties, on the west by Gladwin County, on the south by Bay County and on the east by the Saginaw Bay. The County covers an area of 235,136 acres or about 367 square miles of land and 317.50 square miles of water. Using the 2010 US Census population figures, the population density of the county is 43.8 people per square mile. The County consists of twelve townships, three cities, and three villages. The county seat is in the City of Standish.

**Figure 1: Map Location**



The Pine River runs across the southern portion of the county, the Rifle River runs through the middle portion of the county, and the Au Gres River runs through the eastern side of the county. All of these rivers empty into the Saginaw Bay. Forests comprise 45.7% of the County's surface area. Agricultural uses account for 35.87% of the area.

Arenac County is principally accessible from the north and south by I-75, US-23, M-13, and M-65. East/west travel is limited to M-61, a section of US-23, and paved secondary roadways. I-75 traverses Arenac County from its southwest border through the northwest corner towards West Branch. There are four exits. From south to north, they are the US-23 connector two miles south of Standish, M-61 two miles west of Standish, the Sterling exit, and the M-33 exit near Alger.



North-south surface transportation in Arenac County is provided by Highway M-13 in Standish Township, M-33 in Moffatt Township, M-65 two miles east of the City of Omer, and by I-75 near the western border of the County. East-west access is provided by Highway M-61 from Standish to the western edge of the county. US-23 diverges away from I-75 in the southwestern portion of the county and follows a path mainly along the lakeshore where it leaves the county in the northeast corner.

## What is Hazard Mitigation Planning

The National Preparedness Goal for the security of the United States was released in September of 2011 and the National Mitigation Framework was finalized in May of 2013.

The preparedness goal is:

“A secure and resilient nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risks.”

The National Framework comprises seven core capabilities, including:

- Threats and Hazard Identification
- Risk and Disaster Resilience Assessment
- Planning
- Community Resilience
- Public Information and Warning
- Long-Term Vulnerability Reduction
- Operational Coordination

Risks include events such as natural disasters, disease pandemics, chemical spills and other manmade hazards, terrorist attacks, and cyber-attacks.

Hazard Mitigation is any action taken before, during, or after a disaster to eliminate or to reduce permanently the long-term risk to human life and property from natural, social, and technological hazards. It is an essential element of emergency management, along with preparedness, response, and recovery. There is a cyclical relationship between the four phases of emergency management. A community prepares for disaster, and then responds when it occurs. Following the response, there is a transition into the recovery process, during which mitigation measures are evaluated and adopted. This in turn, improves the preparedness posture of the community for the next incident, and so on. When successful, mitigation will lessen the impacts to such a degree that most succeeding incidents will remain incidents and not become disasters.

Hazard mitigation strives to reduce the impact of hazards on people and property through

the coordination of resources, programs, and authorities so that, at the very least,

communities do not contribute to the increasing severity of the problem by allowing repairs and reconstruction to be completed in such a way as simply to restore damaged property as quickly as possible to pre-disaster conditions. Such efforts expedite a return to “normalcy”; however, replication of pre-disaster conditions, result in a cycle of damage, reconstruction, and damage again.

Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage. Hazard mitigation provides the mechanisms by which communities and individuals can break the cycle of damage, reconstruction, and damage again.

Recognizing the importance of reducing community vulnerability to natural, social, and technological hazards, Arenac County is actively addressing the issues through the development and subsequent implementation of this plan. The many benefits to be realized from this effort include the protection of the public health and safety, preservation of essential services, prevention of property damage, and preservation of the local economic base will help ensure that Arenac County remains a vibrant, safe, and enjoyable place in which to live, raise families, and to conduct business.

Arenac County has worked with Lapham Associates and the Michigan Department of State Police, Emergency Management Division to develop this Hazard Mitigation Plan. The intent of the plan is to work with those familiar with Arenac County to describe the County and to identify clear processes for minimizing or eliminating natural disasters (weather, forest fires, etc.) or emergencies related to the County’s built environment (transportation, infrastructure, buildings, etc.).

The intent of a hazard mitigation plan is to inventory possible hazards, to assess the hazards to which the community is vulnerable, and to provide possible mitigation activities for those hazards. The focus of the hazard mitigation plan is the development of projects and policies that can be implemented to reduce or prevent losses from future disasters. The **Arenac County Hazard Mitigation Plan** includes text, tables, charts and maps necessary to describe and discuss the following: 1) a hazard analysis based on a current community profile, hazard identification, risk assessment, and vulnerability assessment; 2) a listing of the communities’ goals and objectives; 3) a discussion of the alternatives for solving problems; 4) evaluation and prioritization of alternatives; 5) selection of feasible mitigation strategies; and 6) recommended mitigation strategies. The plan contains hazard mitigation elements that can be integrated into county, city, village, and township comprehensive plans.

The process of Hazard Mitigation Planning consists of the following steps:

- 1) Develop community profile and identify community hazards and risks
- 2) Identification and definition of goals and objectives
- 3) Identification of alternatives for solving problems



- 4) Selection of evaluation criteria
- 5) Selection of alternatives
- 6) Preparation of final plan
- 7) Implementation of plan
- 8) Monitoring and periodic revision of the plan

Arenac County through its County Emergency Management Director and Local Planning Team has worked to prepare the Hazard Mitigation Plan. Considerable effort has been made to gain input from stakeholders in the county. This has included meetings with local officials from cities, villages, townships, and other community leaders and the public.

The Disaster Mitigation Act (DMA) of 2000 included new requirements for hazard mitigation planning. To become eligible for hazard mitigation grant program funds in the future, counties must prepare and adopt hazard mitigation plans. These local hazard mitigation plans must meet the requirements of the act adopted by the communities. Recertification of the Hazard Mitigation Plan shall take place at least once every five (5) years.

This plan is the culmination of our interdisciplinary and interagency planning effort that required the assistance and expertise of numerous agencies, organizations, and individuals. Without the technical assistance and contributions of time and ideas of these agencies, organizations and individuals, this plan could not have been completed. All agencies below are ongoing participants in Hazard Mitigation Planning.

**Table 1-1 Arenac County LEPC Membership**

Name	Title	Address
Michael Bowers	Arenac County Emergency Management Coordinator	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Charles Barker	MSP EMHSD	
Yvonne King	Arenac County 911 Director	126 N. Grove St. Standish, MI 48658
Sheriff James Mosciski	Arenac County Sheriff	126 N. Grove St. Standish, MI 48658
Harry Ambs	Saginaw Chippewa Tribal Police Department	6954 E. Broadway St. Mt Pleasant, MI 48858
Sally Mrozinski	Arenac County Board of Commissioners District 1	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Lisa Slagat	Arenac County Board of Commissioners District 2	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Bobbe Burke	Arenac County Board of Commissioners District 3	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Harold Woolhiser	Arenac County Board of Commissioners District 4	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Jim Hergot	Arenac County Board of Commissioners District 5	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Rose Sadler	Chief Administrative Officer Ascension Standish Hospital	805 W. Cedar St. Standish, MI 48658
Thomas Matzke	Ascension Standish Hospital Emergency Management Coordinator	805 W. Cedar St. Standish, MI 48658
Larry Davis	Arenac County Drain Commissioner	120 N. Grove St. P.O. Box 747 Standish, MI 48658
Jennifer Wessel	Arenac County Central Michigan District Health Department	3727 Deep River Rd. Standish, MI 48658
Melissa DeRoche	Arenac County Central Michigan District Health Department	2012 E. Preston St. Mt. Pleasant, MI 48858
Mark Thompson	Mobile Medical Response HQ; Leadership Team Member	843 S. Washington Ave. Saginaw MI 48601

Table 1-2 Jurisdiction Participation		
Jurisdiction	Representative	Address
City of Au Gres	Mayor Michael Headley	124 E. Huron, Au Gres, MI 48658
City of Standish	Mayor Kevin King	399 E. Beaver Street, Standish, MI 48658
City of Omer	Mayor Ed Oliver	201 E. Center St. Omer, MI 48749
Village of Sterling	President James Hazeltine	PO Box 165, 137 E. Main St. Sterling, MI 48659
Village of Twining	President Donald R. Ferguson	PO Box 205, 311 W. Main St. Twining, MI 48766
Village of Turner	President Gary Bates	109 W. Main St. Turner, MI 48765
Adams Township	Supervisor Dan Fisk	7533 W. Ellison Rd. Sterling, MI 48659
Arenac Township	Supervisor Tim Hagley	2596 State Rd. Standish, MI 48658
Au Gres Township	Supervisor James Herzog	1865 S. Swension Rd, Au Gres, MI 48703
Clayton Township	Supervisor Bryon Fogarasi	1057 Dobler Rd. Au Gres, MI 48703
Deep River Township	Supervisor Karla Kroczaleski-Raymond	535 E. State St. Sterling, MI 48659
Lincoln Township	Supervisor Gerald Wenkel	5173 Johnsfield Rd. Twining, MI 48766
Mason Township	Supervisor Mark Heldmann	1225 Maple Ridge Rd. Twining, MI 48766
Moffett Township	Supervisor Raymond Daniels	1590 M-76 Alger, MI 48610
Sims Township	Supervisor Bob Mackie	4489 E. Huron Rd. Au Gres, MI 48703
Standish Township	Supervisor Robert North	4997 Arenac State Rd. Standish MI 48658
Turner Township	Supervisor Herbert Keeley	110 Park St. Twining MI 48766
Whitney Township	Supervisor Donald Becker Jr.	1515 N. Huron Rd. Tawas City MI 48763

Table 1-3 Arenac County Schools and Public Safety	
Name	Address
Sterling Elementary School	338 W. State St. Sterling, MI 48658
Standish-Sterling Central Junior/Senior High School	2401 Grove Rd. Standish MI 48658
Standish-Sterling Central Elementary	3789 Wyatt Rd. Standish MI 48658
Arenac County Independent Newspaper	1010 W. Cedar St. Standish, MI 48658
Moffatt Township Volunteer Fire Department	1590 M-76 Alger, MI 48610
Standish Area Authority Station in 13	317 N. Main St Omer, MI 48749
Standish Area Fire Authority Station 12/Sterling Area Fire Department	510 E. State Sterling, MI 48659
AuGres-Sims-Whitney Fire Department	320 N. Court St. AuGres, MI 48703

### Executive Summary

The Arenac County Hazard Mitigation Plan is created to protect the health, safety, and economic interests of the Arenac County residents and businesses by reducing the impacts of natural, human, and technological hazards through hazard mitigation planning, awareness, and implementation. The plan serves as the foundation for hazard mitigation activities and actions within Arenac County. Implementation of recommendations will reduce loss of life, destruction of property, and economic losses due to natural and technological hazards. The

plan provides a path toward continuous, proactive reduction of vulnerability to hazards which result in repetitive and often, severe social, economic, and physical damage. The ideal end state is full integration of hazard mitigation concepts into day-to-day governmental and business functions and management practices.

This plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in Arenac County. Emphasis is placed on hazards which have resulted in threats to the public health, safety, and welfare, as well as the social, economic, and physical fabric of the community. This plan addresses such hazards as floods, tornadoes, windstorms, winter storms, forest fires, structural fires, hazardous material incidents and secondary technological hazards which result from natural hazard events. It also addresses the potential of civil disturbances, sabotage, terrorism, and possible effects of “climate change.” Each hazard is analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigative action. The plan also lays out the legal basis for planning and the tools to be used for its implementation.

### **Information Collection**

The Hazard Mitigation Planning Committee with assistance from its consultants has reviewed relevant plans, maps, studies, and reports. Federal, State, regional and local government sources were reviewed to develop a current community profile. Information sources include U.S. Census, zoning ordinances, master plans, recreation plans, capital improvement plans, parcel maps, aerial photography, MIRIS land use/land cover, USGS topographic maps, U.S. Weather Service data, NRCS soils maps, Michigan Department of Transportation information, Michigan Hazard Analysis and data, local hazard analysis, emergency management plans, and Section 302 Sites from the Local Emergency Planning Committee.

### **Geographic Information System Support**

Existing data sets were incorporated, and new data sets were created to analyze existing conditions and study potential future scenarios. Specialized maps showing community hazards, land cover use, infrastructure, topography, national wetlands inventory, forest cover, gas and oil wells, zoning, future land use and community facilities were prepared as part of the plan. Maps have aided to identify community characteristics, vulnerable populations, and hazard areas. GIS data and maps will be retained by the community for future use to help implement and monitor hazard mitigation activities.

### **Increased Community Awareness of Hazards and Hazard Mitigation**

Information was disseminated to the communities and public using public meetings, presentations, news releases, websites, and individual contacts. A benefit of the planning process is the education of community leaders and citizens of the community regarding potential hazards. This education supported the decision-making process and will assist communities in making better, more informed decisions in the future. In addition, the process strengthened partnerships between local units of government, planning commissions, emergency services, public agencies and private interests to pool resources and helped to foster communication and understanding between various entities.

By creating lines of communication and increasing awareness of the cross jurisdictional impacts of disasters and land use and policy decisions, better and more informed decisions will be made in the future.

### **Community Involvement**

The planning process provided several opportunities for public, community and agency input and comments. Presentations of the draft plan were made to the County Board of Commissioners for

commissioners' review and approval. The Consultants and staff met with the Hazard Mitigation Planning Committee numerous times during plan development. This group has representatives from local communities, state and federal agencies, and county citizens. The group was instrumental in guiding the plan development. Notices of the public meetings were sent to Hazard Mitigation Planning Committee members, newspapers, and the local communities by Arenac County Emergency Management. Newspaper articles were published in the local newspaper. All local communities participated in the process through surveys, meetings, and by reviewing the draft plan.

#### Meetings

Arenac County Board of Commissioners: Discussed Hazard Mitigation process during public comment portion of the meetings.

Arenac County Emergency Management: Discussed the planning process, discussed hazards and vulnerability; discussed the hazard rankings along with reviewing the process for setting goals & objectives and choosing mitigation strategies with Emergency Management Coordinator present.

Arenac County Hazard Mitigation Committee Meetings: Discussed the planning process, discussed hazards and vulnerability; Established evaluation criteria for hazard rankings, discussed hazards in the community; Finalized Goals & Objectives along with evaluating mitigation strategies.

#### Community Surveys:

Arenac County Emergency Management Director, Ed Rohn and Lapham Associates met with cities, townships, and villages to discuss the Hazard Mitigation Plan process. Mr. Bowers led each municipality through the community survey. The nine-question survey was used to gather information about seasonal population characteristics, major community events and festivals, natural and technological hazards, community preparedness for hazard events, and ideas for hazard mitigation. The results were used to guide the planning effort and to compare hazard information gathered from the various sources and local officials understanding of hazard issues. A summary of the survey and community responses can be found in the Appendix.

## **2016/17 Arenac County Hazard Mitigation Plan Municipal Questionnaire Results & Summary**

Surveys and memoranda were sent to all Arenac County municipalities. Below are the results and summary of the municipal questionnaire.

### **1. Does your community have large seasonal shifts in population?**

#### **Summary:**

Adams Township – No  
Arenac Township – Yes  
Au Gres Township – Yes  
City of Au Gres – Yes

City of Omer – Yes but not large; some snowbirds return in the spring and have campground and canoeing all around and through the city.

City of Standish – No

Clayton Township – No

Deep River Township – “Notable” Seasonal residents and campgrounds.

Lincoln Township – No. A few snowbirds.

Mason Township – No (deer season hunters but not significant)

Moffatt Township – Yes

Sims Township – Yes

Standish Township – Yes

Turner Township – No

Village of Sterling – No

Village of Turner – No

Village of Twining – No

Whitney Township – Yes. Snowbirds and others.

### **What are the changes in increases or decreases?**

#### **Summary:**

Adams Township – N/A

Arenac Township – Perhaps double

Au Gres Township – +/- 25%

City of Au Gres – Population increases up to 20%; US-23 traffic increases dramatically.

City of Omer – Approximately +/- 10% of the population.

City of Standish – N/A

Clayton Township – +/- 5%

Deep River Township – +/- 200 seasonal.

Lincoln Township – N/A

Mason Township – N/A

Moffatt Township – 50%

Sims Township – Population 1100

Standish Township – 30%

Turner Township – Summer traffic on M-65.

Village of Sterling – +/- 5%

Village of Turner – N/A

Village of Twining – N/A

Whitney Township – Up to 10x population in the summer.

### **At what time of the year do population changes occur? Summary:**

Adams Township – N/A

Arenac Township – Spring fishing, summer campgrounds, canoe liveries, and tourism through fall with hunting.

Au Gres Township – Summer and some in the fall

City of Au Gres – Spring through fall.

City of Omer – Spring and fall.

City of Standish – N/A

Clayton Township – Fall and spring.

Deep River Township – Mainly in the summer.

Lincoln Township – Spring and fall.

Mason Township – N/A

Moffatt Township – Summer

Sims Township – Spring, summer, and fall.

Standish Township – Summer (March – October)

Turner Township – Deer season.

Village of Sterling – Lower in winter/higher in summer

Village of Turner – N/A

Village of Twining – N/A

Whitney Township – Spring, summer, and fall.

**2. Are there a significant number of seasonal homes in the community?**

**Summary:**

Adams Township – No

Arenac Township – Not significant.

Au Gres Township – Yes

City of Au Gres – Yes

City of Omer – No

City of Standish – No

Clayton Township – Did not answer.

Deep River Township – Not significant.

Lincoln Township – No

Mason Township – No

Moffatt Township - Yes

Sims Township – Yes

Standish Township – Seasonal homes have decreased but still significant. A number of campgrounds.

Turner Township – No

Village of Sterling – No  
Village of Turner – No  
Village of Twining – No  
Whitney Township – Yes.

**3. Do large numbers of people come to your community to hunt, fish, snowmobile, camp, etc.?**

**Summary:**

Adams Township – Some  
Arenac Township – Yes  
Au Gres Township – Yes; two campgrounds.  
City of Au Gres – Yes  
City of Omer – Not large but significant numbers; camping, kayaking, canoeing, fishing, and hunting.  
City of Standish – Yes; thousands pass through on US-23 and the community is surrounded by campgrounds.  
Clayton Township – Did not answer.  
Deep River Township – Deer hunting and campgrounds in the summer and fall.  
Lincoln Township – Two hunt clubs, hunters, and a small campground.  
Mason Township – No  
Moffatt Township – Yes and transient from I-75 and RR-33.  
Sims Township – Yes  
Standish Township – Camping and fishing  
Turner Township – Deer hunting.  
Village of Sterling – No  
Village of Turner – No  
Village of Twining – No. Lots of people pass through town on M-65.  
Whitney Township – Some. Brown RV Park and motel. There are a lot of forest areas in the western part of the township. Not a lot of people snowmobile in the area.

**4. Are there any annual events held in the community that attract large numbers of people? If so, describe the event(s), location, dates and approximate attendance.**

**Summary:**

Adams Township – No  
Arenac Township – Sucker Festival in Omer and Mud Bogs at campground.  
Au Gres Township – Not in the township; the City of Au Gres has some such as the Walleye Tournament.  
City of Au Gres – Car show, Halloween, one tournament, fishing tournaments, and county fireworks.  
City of Omer – Fish Run and Sucker Derby in April on the Rifle River.  
City of Standish – Depot Days, county fair, and car show.  
Clayton Township – No  
Deep River Township – Deer Season.



Lincoln Township – Ball diamond events (100+) and ball tournaments daily in the summer (May – August).

Mason Township – No

Moffatt Township – Forest Lake Music Festival (150 people) and Forest Lake Summer Picnic (400-600 people).

Sims Township – No

Standish Township – No, but casino has large number of patrons daily. Pow Wow at casino in the summer has high attendance.

Turner Township – None.

Village of Sterling – Sterling Health Center hold annual health fair in area in the late summer with attendance in the hundreds.

Village of Turner – Annual Christmas party. Party second week of December at the Village Hall. Approximately 50 people attend.

Village of Twining – No

Whitney Township – No (but in Tawas and Au Gres)

5. **Please rate the following natural hazards each 1-10, with 1 being a low threat to your community and 10 a high threat. Hazards are considered events that can cause death or injury, damage property or the environment, or disrupt business or services.**

**Wildfire –**

Adams Township – 2

Arenac Township –

10 Au Gres Township

– 2 City of Au Gres –

1 City of Omer – 5

City of Standish – 1

Clayton Township – 7

Deep River Township – 9 (a lot of woods and forests in the township)

Lincoln Township – 5

Mason Township – 8

Moffatt Township – 10

Sims Township – 7

Standish Township – 4

Turner Township – 8

Village of Sterling – 3

Village of Turner – 5

Village of Twining – 1

Whitney Township – 5 (peat farms and woods)

**Tornado –**

Adams Township – 2

Arenac Township – 7

Au Gres Township – 7

City of Au Gres – 2  
City of Omer – 5  
City of Standish – 5  
Clayton Township – 4  
Deep River Township – 3  
Lincoln Township – 4  
Mason Township – 4  
Moffatt Township – 5  
Sims Township – 2  
Standish Township – 2  
Turner Township – 3  
Village of Sterling – 5  
Village of Turner – 7  
Village of Twining – 3  
Whitney Township – 3

**Flood (River/Lake Shoreline) –**

Adams Township – 1 (only 1 house in floodplain)  
Arenac Township – 10  
Au Gres Township – 7 (in the spring)  
City of Au Gres – 1  
City of Omer – 9  
City of Standish – 3  
Clayton Township – 1  
Deep River Township – 9 (Rifle River)  
Lincoln Township – 2 (Pine River and Melita Road bridge just past South 23)  
Mason Township – 1  
Moffatt Township – 2 (rivers in deep valleys)  
Sims Township – 3  
Standish Township – 7 (Nor'easters very powerful and erode shore banks and flood homes)  
Turner Township – 9 (rivers and drains; drains two counties north)  
Village of Sterling – 4  
Village of Turner – 7 (all farms drain into creek; no storm sewers; clay soils)  
Village of Twining – 1  
Whitney Township – 4 (good drainage system. Whitney drains has erosion problems- Turner Road culvers and banks of Whitney Drain)

**Severe Wind –**

Adams Township – 8  
Arenac Township – 8  
Au Gres Township –  
9 City of Au Gres – 4  
City of Omer – 8  
City of Standish – 8  
Clayton Township – 4

Deep River Township – 8  
Lincoln Township – 7  
Mason Township – 8  
Moffatt Township – 7  
Sims Township – 8  
Standish Township – 10  
Turner Township – 8  
Village of Sterling – 8  
Village of Turner – 7  
Village of Twining – 6 (surrounded by farmland)  
Whitney Township – 5 (northeasters with ice and many dead ash trees throughout the township)

**Winter Weather Hazards –**

Adams Township – 3  
Arenac Township – 8  
Au Gres Township – 8  
City of Au Gres – 4  
City of Omer – 8  
City of Standish – 7  
Clayton Township – 3  
Deep River Township – 5 (Village of Sterling sewage ponds leakage)  
Lincoln Township – 8 (I-75)  
Mason Township – 5  
Moffatt Township – 5 (steep pitch roofs above M-55)  
Sims Township – 5  
Standish Township – 7  
Turner Township – 5  
Village of Sterling – 8  
Village of Turner – 7 (winter storm drifting)  
Village of Twining – 7  
Whitney Township – 5

**Thunderstorm (Lightning/Hail) –**

Adams Township – 5  
Arenac Township – 8  
Au Gres Township – 8  
City of Au Gres – 4  
City of Omer – 8  
City of Standish – 6  
Clayton Township – 2  
Deep River Township – 8  
Lincoln Township – 8  
Mason Township – 8  
Moffatt Township – 7  
Sims Township – 8

Standish Township – 8  
Turner Township – 7  
Village of Sterling – 8  
Village of Turner – 7  
Village of Twining – 6  
Whitney Township – 5

**Earthquakes –**

Adams Township – 1  
Arenac Township – 1  
Au Gres Township –  
1 City of Au Gres – 1  
City of Omer – 1  
City of Standish – 1  
Clayton Township – 1  
Deep River Township – 1  
Lincoln Township – 1  
Mason Township – 0  
Moffatt Township – 1  
Sims Township – 1  
Standish Township – 2  
Turner Township – 1  
Village of Sterling – 1  
Village of Turner – 2  
Village of Twining – 1  
Whitney Township – 1 (icequakes in winter)

**Drought –**

Adams Township – 2  
Arenac Township – 5  
Au Gres Township – 5  
City of Au Gres – 1  
City of Omer – 1  
City of Standish – 1  
Clayton Township – 3  
Deep River Township – 3  
Lincoln Township – 3  
Mason Township – 3  
Moffatt Township – 1 (7 streams going into Forest Lake)  
Sims Township – 3  
Standish Township – 6  
Turner Township – 7  
Village of Sterling – 7  
Village of Turner – 5  
Village of Twining – 1  
Whitney Township – 3

**Extreme Temperatures –**

- Adams Township – 2
- Arenac Township – 5
- Au Gres Township – 2
- City of Au Gres – 3
- City of Omer – 6
- City of Standish – 7
- Clayton Township – 3
- Deep River Township – 5 (cold not hot)
- Lincoln Township – 5
- Mason Township – 5
- Moffatt Township – 2
- Sims Township – 3
- Standish Township – 6
- Turner Township – 6
- Village of Sterling – 7
- Village of Turner – 7
- Village of Twining – 6 (extreme cold; floor heavings; storm drains frozen)
- Whitney Township – 4

6. **Please rate the following social or technological hazards each 1-10, with 1 being a low threat to your community and 10 a high threat.**

**Public Health Emergencies –**

- Adams Township – 1
- Arenac Township – 5
- Au Gres Township – 4
- City of Au Gres – 2
- City of Omer – 7
- City of Standish – 5
- Clayton Township – 4 (whooping cough)
- Deep River Township – 2 (two schools in township)
- Lincoln Township – 2
- Mason Township – 1
- Moffatt Township – 2 (1 small foster care home – 6-8 people)
- Sims Township – 2 (E. coli beach incidents)
- Standish Township – 2
- Turner Township – 3
- Village of Sterling – 3
- Village of Turner – 2
- Village of Twining – 5 (school in town)
- Whitney Township – 6 (E. coli at beaches)

**Structural Fires –**

Adams Township – 1  
Arenac Township – 7  
Au Gres Township – 1  
City of Au Gres – 3  
City of Omer – 6  
City of Standish – 2  
Clayton Township – 4  
Deep River Township – 3  
Lincoln Township – 5  
Mason Township – 5  
Moffatt Township – 2 (most construction modern)  
Sims Township – 3 (fire department mutual aid)  
Standish Township – 3  
Turner Township – 6  
Village of Sterling – 5  
Village of Turner – 5  
Village of Twining – 8 (many older structures)  
Whitney Township – 6

**Oil and Gas Well Accidents –**

Adams Township – 5 (+/- 24 active wells)  
Arenac Township – 7 (Consumer Gas line)  
Au Gres Township – 5  
City of Au Gres – 1 (gas pipeline on city border with township)  
City of Omer – 2 (natural gas pipeline)  
City of Standish – 1 (natural gas pipeline)  
Clayton Township – 3 (DTE gas line in township)  
Deep River Township – 8  
Lincoln Township – 4 (gas lines M-61 and US-23)  
Mason Township – 1  
Moffatt Township – 8 (1 oil well, pipeline, and Enbridge #5)  
Sims Township – 2 (oil wells capped)  
Standish Township – 2 (gas well in Lincoln Township at border with township)  
Turner Township – 7 (have number of oil wells; one major)  
Village of Sterling – 3  
Village of Turner – N/A  
Village of Twining – 3 (C/E line on M-65)  
Whitney Township – 9 (natural gas lines on US-23)

**Civil Disturbances –**

Adams Township – 1  
Arenac Township – 1  
Au Gres Township – 1  
City of Au Gres – 1  
City of Omer – 1

City of Standish – 1  
Clayton Township – 1  
Deep River Township – 1  
Lincoln Township – 4  
Mason Township – 1  
Moffatt Township – 1  
Sims Township – 1  
Standish Township – 8  
Turner Township – 1  
Village of Sterling – 2  
Village of Turner – 2  
Village of Twining – 1  
Whitney Township – 1

**Infrastructure Failure –**

Adams Township – 5 (many power outages)  
Arenac Township – 8 (dead ash trees falling on electrical lines)  
Au Gres Township – 5 (2 critical bridges and some culverts need to be replaced)  
City of Au Gres – 4 (sewer lines very old)  
City of Omer – 7  
City of Standish – 7  
Clayton Township – 2  
Deep River Township – 8  
Lincoln Township – 3  
Mason Township – 1  
Moffatt Township – 1 (all transmission lines in danger of trees falling – dead ash trees)  
Sims Township – 2  
Standish Township – 8  
Turner Township – 10 (drains, roads, culverts, box bridges, ash trees falling on power lines, and damming rivers)  
Village of Sterling – 7  
Village of Turner – 6 (storm sewers over 50 years old; street drains)  
Village of Twining – 8 (storm and storm sewer)  
Whitney Township – 5 (Turner Road, Whitney Drain, water system, and towers)

**Dam Failure –**

Adams Township – N/A  
Arenac Township – 4 (Forest Lake Dam)  
Au Gres Township – N/a  
City of Au Gres – 1  
City of Omer – 8 (dam on Forest Lake northwest of the city)  
City of Standish – N/A  
Clayton Township – 1  
Deep River Township – 6 (Forest Lake Dam failure possible and control levels)  
Lincoln Township – 1

Mason Township – 1  
Moffatt Township – 2  
Sims Township – 1  
Standish Township – 1 (no dams in township)  
Turner Township – 1  
Village of Sterling – 1  
Village of Turner – N/A  
Village of Twining – 1  
Whitney Township – 1

**Hazardous Material Incidents –**

Adams Township – 4 (I-75 and Old 76; “cow manure”; large farms in and around)  
Arenac Township – 8 (US-23, State Road, Lake State RR, and M-65)  
Au Gres Township – 5  
City of Au Gres – 5 (US-23 hazardous materials transport)  
City of Omer – 8 (US-23)  
City of Standish – 8 (all hazardous materials to Northeast Michigan go through Standish)  
Clayton Township – 2 (from diesel fuel tankers and storage)  
Deep River Township – 9 (M-76, I-75, and M-33)  
Lincoln Township – 8 (Helena Charm (fertilizer), Ferrell Gas, Andersons Elevator (fertilizer and grains), SERA Title III Site, and Railroad.  
Mason Township – 6  
Moffatt Township – 9 (service station, farmers, and I-75)  
Sims Township – 6 (lakeshore transport accidents)  
Standish Township – 8 (propane sales and farmers)  
Turner Township – 8 (M-65 and Great Lake Railroad)  
Village of Sterling – 6  
Village of Turner – 7 (farm operations and elevator)  
Village of Twining – 9 (propane; transport on M-65; storage)  
Whitney Township – 6 (US-23 is a main transportation route for Northeast Michigan; accidents on US-23 due to fuel transport; recent spills of 4,000 gallons of gas; Saginaw-Midland Water Plant acids at water plant for backwash)

**Air, Land, or Water Transportation Accidents –**

Adams Township – 3 (I-75 and Old 76)  
Arenac Township – 8 (land)  
Au Gres Township – 8  
City of Au Gres – 5 (boating accidents, fishing, etc.)  
City of Omer – 9 (land)  
City of Standish – 8 (I-75, US-23, M-65, and M-61)  
Clayton Township – 2  
Deep River Township – 9  
Lincoln Township – 8  
Mason Township – 6  
Moffatt Township – 7 (hazard materials; I-75, Maple Road, and M-33)



Sims Township – 8 (US-23 transports)  
Standish Township – 8 (US-23 / M-13)  
Turner Township – 8 (M-65, disposal wells, and new oil well proposed recently)  
Village of Sterling – 7  
Village of Turner – 7 (farmland chemicals; hazardous materials trucks; Class A, Maple Ridge is a Class A road and short cut across county I-75 to US-23; sugar beets)  
Village of Twining – 8 (Lake State Railroad; degraded not allowed to carry hazard materials.  
Whitney Township – 6 (Big Charity Island from Browns Landing; routes to hospitals; helicopter routes over township)

**Terrorism/Sabotage –**

Adams Township – 1  
Arenac Township – 7 (“Operation Stone Garden”; illegal transportation of goods and people across the lake)  
Au Gres Township – 8  
City of Au Gres – 1  
City of Omer – 2  
City of Standish – 1 (but high potential for computer hacking, drone attacks at water plants, hazardous material storage sites, propane storage, etc.)  
Clayton Township – 1  
Deep River Township – 1  
Lincoln Township – 3 (US-23 and I-75)  
Mason Township – 1  
Moffatt Township – 1  
Sims Township – 1  
Standish Township – 3 (Saginaw Bay shoreline vulnerability)  
Turner Township – 2  
Village of Sterling – 2  
Village of Turner – 1  
Village of Twining – 2  
Whitney Township – 2 (water plant)

**7. What type of specific hazard (social, natural, or technological) do you think your community is least prepared for? Why?**

**Summary:**

Adams Township – Sabotage  
Arenac Township – Transportation of hazardous materials and infrastructure failures.  
Au Gres Township – Tornadoes, meth labs and other hazardous materials, and sabotage.  
City of Au Gres – Terrorist act.  
City of Omer – Hazard materials accident.  
City of Standish – Unguarded water plants and hazardous material storage sites.  
Clayton Township – Earthquakes, tornadoes, and hazardous material incidents.  
Deep River Township – Hazard material spills.

Lincoln Township – Sabotage and civil disturbance.  
Mason Township – Chemical spills and hazard materials.  
Moffatt Township – Large forest fires.  
Sims Township – Earthquakes  
Standish Township – Tornadoes and terrorism.  
Turner Township – Transit accidents and hazardous materials.  
Village of Sterling – Chemical spills.  
Village of Turner – Elevator fire.  
Village of Twining – Terrorism.  
Whitney Township – Terrorism and severe storms.

**Why are you not prepared?**

Adams Township – N/A  
Arenac Township – Not sufficient training or equipment.  
Au Gres Township – N/A  
City of Au Gres – Believe they are not prepared but believe an even to be unlikely;  
Au Gres water supply vulnerable-Saginaw-Midland water supply intakes are the number 1 risk in the county.  
City of Omer – Not sufficient equipment to address possible situations.  
City of Standish – Not prepared for physical or computer attacks.  
Clayton Township – Did not answer.  
Deep River Township – Least prepared and most risk.  
Lincoln Township – Not prepared.  
Mason Township – M-65 Lake States Railroad and Maple Ridge now Class A roads.  
Moffatt Township – A lot of Jack Pines and fires are difficult to fight.  
Sims Township – Not prepared.  
Standish Township – Least expected and not prepared  
Turner Township – Not sufficient equipment to fight.  
Village of Sterling – Not prepared.  
Village of Turner – Twining is nearest fire department 3 miles away)  
Village of Twining – No police department; civil disturbances; not prepared.  
Whitney Township – Most other things they are prepared for.

**8. What type of specific hazard (social, natural, or technological) do you feel your community is best prepared for? Why?**

**Summary:**

Adams Township – Structure fires and grass fires.  
Arenac Township – Structural fires and civil disturbances.  
Au Gres Township – Structural fires and wildfires.  
City of Au Gres – Structural fires.  
City of Omer – Structural fires.  
City of Standish – Industrial/manufacturing (Magline and Vantage) structural or hazardous materials.  
Clayton Township – Structural fires.  
Deep River Township – Wildfire and structural fires.  
Lincoln Township – Structural fires.

Mason Township – Wildfires.  
Moffatt Township – Structural fires. Sims Township – Structural fires.  
Standish Township – Wildfires and structural fires. Turner Township – Wildfires and structural fires. Village of Sterling – All fire types.  
Village of Turner – Can live through extreme temperatures. Village of Twining – Structural fires.  
Whitney Township – Wildfires, structural fires, and meth labs.

**Why are you prepared?**

Adams Township – Good fire department 3 miles away and DNR fire fighters are prepared and good.  
Arenac Township – Have a good fire department. Have an excellent sheriff’s department. Township hall is a Red Cross shelter but needs a generator.  
Au Gres Township – N/A  
City of Au Gres – Have an excellent fire department.  
City of Omer – Good fire department and arrangements with surrounding communities.  
City of Standish – Fire departments are trained and equipped for these threats. Clayton Township – Sterling Fire Department is well trained and prepared.  
Deep River Township – “Fire department rocks”  
Lincoln Township – Have a good fire department.  
Mason Township – Good readiness and cooperation by Department of Natural Resources and local fire departments.  
Moffatt Township – Good communication with residents, good coordination, good fire department, good material assistance, etc.)  
Sims Township – Very good fire department and mutual aid with other Arenac County fire departments.  
Standish Township – Good fire department and mutual aid agreements with city and other communities.  
Turner Township – Excellent fire department. Village of Sterling – Good fire department.  
Village of Turner – N/A  
Village of Twining – Good fire department and mutual aid.  
Whitney Township – Have great fire departments in Tawas, Twining, Standish, Au Gres, and the State Police and U.S. Department of Justice to do the cleanup.

9. Important: This information is also a requirement to receive funding in the event of a disaster. What types of initiatives, projects, mitigation strategies, improvements, or efforts (i.e., public education, training, equipment, programs, communications, etc.) do you think could be implemented that would help reduce your community’s vulnerability to specific hazards? (Please state specifics and list as many as you can)

Summary:

- Adams Township –
- Arenac Township –
- Au Gres Township –
- City of Au Gres –
- City of Omer –
- City of Standish –
- Clayton Township –
- Deep River Township –
- Lincoln Township –
- Mason Township –
- Moffatt Township –
- Sims Township –
- Standish Township –
- Turner Township –
- Village of Sterling –
- Village of Turner –
- Village of Twining –
- Whitney Township –

To be answered later with Emergency Management Director and LPT Committee.

#### Other Public Outreach

Arenac County sent out newsletters informing every jurisdiction in the region, including Arenac County jurisdictions & surrounding counties, about the Hazard Mitigation Plan. Contact information was made available in the newsletter. Feedback, questions, suggestions, and comments were invited from these jurisdictions and the public. The Emergency Management Director contacted officials from county and neighboring communities to assess differences and

similarities in hazard risks and the proposed mitigation actions. Any comments or advice obtained was discussed with local officials. The discovery process included Region Three Homeland Security Planning Board representatives as well as neighboring county officials and important issues were added to the plan.

The draft plan was made available on the Arenac County Emergency Management Website for review and input from Arenac County and all surrounding counties and their citizens throughout the entire planning process.

The Emergency Management Director and the consultants made presentations at the township association meetings and met with each municipality to discuss the plan and to receive input regarding needed mitigation strategies and actions.

### Public Input of Draft Plan

A copy of the draft plan on CD was sent to local communities and any agencies requesting a copy for review. All communities had an opportunity to review and to provide input on the plan. In addition, copies of the plan were available for review by the public at the County Clerk's office. The plan was posted on Arenac County's web site. Notices were put in the local newspapers to inform the public that the draft plan was available for review. Feedback, comments, suggestions, and additions were invited from the public. Neighboring counties were also sent a draft plan electronically for their review, feedback, comments, and suggestions.

### **Summary of Review and Approval of Plan**

A draft plan was reviewed by the steering committee, stakeholders, and the public. Comments and suggestions obtained in the review process were incorporated into the final plan. The final plan contains mitigation strategies and an action plan that assigns priorities for specific hazards and mitigation measures; defines roles and responsibilities; and identifies the process for reviewing and updating the plan. The hazard mitigation plan was approved by Arenac County Board of Commissioners on **September 20, 2021** and distributed to the various municipalities for review and adoption.

The Arenac County Hazard Mitigation Plan represents Arenac County and all the local jurisdictions which include: The Townships of Adams, Arenac, Au Gres, Clayton, Deep River, Lincoln, Mason, Moffatt, Sims, Standish, Turner, and Whitney; the City of Au Gres, the City of Standish, and the City of Omer; the Village of Sterling, Village of Turner, and the Village of Twining. All the participating communities are adopting the plan. It is anticipated that in the future communities may identify projects, present them to the Hazard Mitigation Committee, and request to have the plan amended to include the projects.

### **Summary of Recommended Plan Implementation Process**

The primary entities responsible for implementing the Hazard Mitigation Plan are the Arenac County Board of Commissioners and the Arenac County Emergency Management Coordinator. The Local Emergency Management Committee (LEPC) and the Local Planning Team (LPT) are organized under Michigan SARA Title III Program and meet on a regular basis to carry out their duties. The committee expanded its role to function as the County Hazard Mitigation Committee to create and oversee implementation of the plan. The Arenac County Emergency Management Coordinator will function as the staff person to provide program administration and project oversight. The meeting participants developed a five- year action list of projects from the mitigation strategies in the Arenac County Hazard Mitigation Plan. The Hazard Mitigation Committee should review the hazard mitigation plan each year at its annual meeting to determine what projects have been accomplished and to add new projects to the five-year action list if appropriate.

**The Hazard Mitigation Committee should identify steps needed to complete a chosen project, such as funding sources, staff and agencies required to complete the project, timelines, and overall project costs.**

The Hazard Mitigation Planning Committee is a subcommittee of the Arenac County LPT. It will function, as does the LPT, under Arenac County Board of Commissioners. Members of the Hazard Mitigation Planning Committee must be members of the LPT, who in turn are appointed by the County Board of Commissioners. Staff support will be provided by the Arenac County Emergency Management office.

Local units of government, county departments, and local, state, and federal agencies will have the ability to propose and support projects from the hazard mitigation plan. Coordinating with the Hazard Mitigation Planning Committee will support plan implementation and allow the committee to monitor progress and determine the timing and scope of plan revisions.

### **Process to Incorporate into Local Planning Activities**

Arenac County cities, villages, and its townships, as well as local and state agencies should integrate information from the Hazard Mitigation Plan into their respective comprehensive and operations plans. Land use planning and zoning is administered at the county, city, village and township levels. As a part of the education and outreach of the hazard mitigation effort, communities are encouraged to incorporate hazard mitigation planning into their respective comprehensive planning and capital improvements planning and to adopt zoning regulations that will prevent the occurrence and will mitigate effects of disasters.

### **Planning Process**

Arenac County and the Emergency Management Division (MSP/EMHSD) of the Michigan Department of State Police have developed a Hazard Mitigation Plan to identify and address issues related to hazard mitigation in the County. Arenac County performed the following actions to develop the plan.

#### **Action #1 – Establish Planning Committee**

Arenac County established a Hazard Mitigation Planning Committee from the Local Emergency Planning Committee and Local Planning Team (LPT). The purpose of this committee was to assist in developing the plan, review draft materials, review potential actions, and establish evaluation criteria. The committee included representatives from:

1. Arenac County Emergency Management Coordinator's Office
2. Arenac County Board of Commissioners
3. Arenac County Sheriff Department
4. CMHD Health & Human Services
5. Arenac County MSU Extension
6. Local EMS
7. Local Fire Departments

8. Municipal Representatives
9. Red Cross
10. State Police
11. Public Works
12. Hospital Safety & Emergency
13. Radio Amateur Civil Emergency Service
14. Emergency Management Systems

Once the committee was formed it met during scheduled and special meetings to complete the new Hazard Mitigation Plan.

### Action #2 – Prepare Community Profile

This action describes the County's physical and social attributes.

**Physical Profile** – The physical attributes of Arenac County are described using maps, tables and text. Existing mapped digital information and other information are used to describe the County's land uses (including industrial areas), climate, water features, soils, flood plains, transportation network, public facilities (fire stations, police, schools, community offices), hospitals, landfills, known hazards, and other natural and built features.

The committee reviewed both the maps and the text to describe the County's current situation.

**Social Profile** – Arenac County's population, population trends and projections are included for each community within Arenac County. Countywide information, taken from the 2010 Census and other sources, describes residents' ages, gender, housing, household composition, race, physical disabilities, income, employment, poverty status, and other social and economic circumstances.

### Action #3 – Community Input/Hazard Identification

Throughout the planning process units of government and other organizations have identified issues that influence their communities.

**Key Person Interaction** – At meeting of the committee, communities, and organizations Hazard Mitigation questions were posed and key themes and issues were recorded. The results are incorporated into this document. A survey of potential hazards and possible ways to prevent or mitigate disasters was sent to each local community. Specific mitigation actions were solicited of each municipality and results were tabulated and used in the analysis of risks and formulation of methods to mitigate hazards.

### Action #4 – Risk Assessment

The list of potential hazards compiled by Arenac County, the individual communities, and

organizations in Action #3 were reviewed by the Hazard Mitigation Planning Committee. The risk of each submitted hazard was assessed based on various criteria such as the frequency of such hazards in Michigan, occurrence trends, levels of impact, and other pertinent information.

### Action #5 – Vulnerability Assessment

The Hazard Mitigation Planning Committee measured the vulnerability of Arenac County to the identified potential hazards. When the potential hazards were compared to the Action #2 – Community Profile, the potential for harm was clear. When hazards are combined with people, property, and other resources, serious consequences can occur. Hazard Mitigation Planning intends to make hazards less damaging to people, property, and resources.

The Committee looked at population concentrations, age-specific populations, development pressures, types of housing (older homes, mobile homes), presence of agriculture, and other situations that could make Arenac County more vulnerable to specific hazards.

### Action #6 – Issues and Goals

The County developed a list of issues identified during Actions 2-5. These issues include those identified through existing information and through community input, risk assessment, and vulnerability assessment. Once a complete list of issues was developed, the County worked with the committee to establish a set of goals and objectives to address the County's issues related to Hazard Mitigation.

### Action #7 – Identify Alternatives

The Committee developed mitigation strategies for hazards in the county. This process flowed from Action #6 when the Committee developed goals and objectives – this action lists strategies for addressing the County's goals. Some issues have many alternatives while others have only one potential solution.

### Action #8 – Establish Evaluation Criteria

Committee discussed and agreed upon criteria to establish priorities for projects. This step started much earlier in the planning process to limit developing criteria for projects identified during the planning process but was modified after the committee identified the strategies. The Committee developed, with the assistance of Emergency Management Coordinator and the Consultant, a “weighted” list of criteria to allow ranking of each potential hazard.

### Action #9 – Develop Mitigation Actions

The evaluation criteria were used to scrutinize all the projects submitted by County agencies, communities, school districts, and other organizations. Each project has a priority, responsible parties, timeline, and potential funding sources.



Action #10 – Plan Approval

The County prepared copies of a Draft Hazard Mitigation Plan for public review. A copy of the Draft Hazard Mitigation Plan was forwarded to the Emergency Management Division of the Michigan State Police and FEMA for their review and recommendations. The County held a public hearing to receive comments on the Plan. After the public hearing, the County and the Emergency Management Division made necessary changes and recommended approval of the Plan by the Arenac County Board of Commissioners. The Arenac County Board of Commissioners approved the plan on May 20, 2021.

Action #11 – Plan Implementation

The Arenac County Emergency Management Coordinator will use the plan to coordinate Hazard Mitigation programs across Arenac County and the region. The Plan focuses on the period from 2021 thru 2026. The Arenac County Emergency Management Director will report annual progress of the plan to members of the Hazard Mitigation Planning Committee. Additionally, if amendments to the plan are necessary during the five-year planning period, the Hazard Mitigation Planning Committee will reconvene to prepare them.

**Incorporate Hazard Mitigation in Other Plans**

As a part of the education and outreach aspect of the hazard mitigation effort, communities will be encouraged to incorporate hazard mitigation planning into their respective comprehensive planning and capital improvements planning and to adopt zoning regulations that will minimize effects of hazards. The Arenac County Hazard Mitigation Plan will be considered and analyzed by local officials when updating local plans and reviewing event and development proposals put forth in their communities.



Chapter 2

*Community Profile*



Figure 2: History



The following section describes the area's natural and built environments. The purpose is to provide users of the Plan with an overview of the County since hazards are often closely related to the physical features of an area.

### **Planning Area**

This Plan serves the County of Arenac. In some instances, information is provided for the individual communities within the County, for the entire County, or for the State of Michigan to provide a better understanding of the area.

### **Community**

## **Characteristics Location**

Arenac County is in east-central Michigan on the Saginaw Bay. Bordered by Iosco and Arenac Counties to the north, Gladwin and Bay Counties to the west, and Bay County to the south, and Lake Huron to the east. The County covers an approximate area of 235,136 acres or approximately 367 square miles of land and 317.50 square miles of water. The county is 30 miles wide from east to west at its widest point and 17 miles from north to south at its deepest point. Using the 2010 US Census population figures, the population density of the county is 43.8 people per square mile. The County consists of twelve townships, three cities, and three villages. The county seat is located in the City of Standish.

### **History**

Arenac County derives its name from a combination of the Latin "arena" and Indian "ac" meaning a "sandy place." It is an appropriate name because it was to the 47.3 miles of sandy shores that the Native Americans, who first inhabited the area, traveled to gather the sturdy beach grasses for basket making or to launch their canoes to fish. It was the first sight European trappers and later settlers saw when they navigated the Saginaw Bay region of the Great Lakes and the sandy beaches are what have attracted modern day residents and tourists who have come here to live year-round or for the season to enjoy the winds, water, and all the natural resources of the region.

Arenac was originally plotted in 1831 but was not organized as a county until 1883. Arenac originally included the townships of Gibson, Mt. Forest, and Pinconning, but when Bay County was organized in 1857, these townships were placed in Bay County.

Arenac Township was the first organized township (1859) and took in all the lands originally designated as the County of Arenac. Au Gres and Clayton townships were organized in 1870, Deep River and Standish Townships in 1873, Mason and Moffatt in 1875, Whitney in 1879 and Lincoln in 1880. These jurisdictions remained the same until Arenac was set apart from Bay County and became a county in 1883. After the county was formed, three other townships were organized, Adams and Turner in 1886 and Sims in 1917.

The first county seat was in Omer. At an election held on Monday April 4, 1892, the people moved the county seat to Standish by a vote of 831 to 609.

The Native Americans lived in the area for many centuries before European exploration, but development forced the Native American life to change or disappear. One of the earliest recorded contacts by Europeans appears in the journal of Father Henry Nowvells, S.J. It indicates that he and two Frenchmen came from St. Ignace to the Au Gres River on November 21, 1675, 26 years before Detroit was founded. They visited Native Americans near the mouth of the river for several days. They went on to spend the winter among natives of the Saginaw Valley.

Rivalry among the tribes for food and hunting and fishing areas was the cause of much warfare among the Indian tribes. Significant battles were fought at many places. Expansion of Europeans into the North American continent brought explorers and fur traders to the Great Lakes to establish posts for exchanging food supplies and other goods for furs. Then came battles between French, British, and Indians for the same lands.

Vast forest areas of the Great Lakes became prime targets for the lumber industry. The Logging Era in the mid to late 1800's opened Arenac County and the rest of northern Michigan for development in farming and manufacturing. Logging peaked in the county in 1872 when more than 80 million board feet of timber went to the mills.

As the trees were cleared, the open land attracted settlers to farm the land. Most of the early settlers came from Canada, starting with the Scottish and English followed by the French and Germans. Later arrivals included Polish, Slavic, and Balkan immigrants.

Tourism began at the turn of the 20<sup>th</sup> century when Point Lookout, north of Au Gres, was a popular resort area for the business families of Bay City and Saginaw. Twice daily paddle-wheel steamships took tourists back and forth across the Saginaw Bay.

In the 1930's oil was discovered in the sandy formations around Sterling in what is known as the Dundee Rock Formation section about 2,900 feet deep. The quest for petroleum after WWII created an oil boom in Arenac County. During the 1940's and 1950's, the Dundee formation around Sterling was the most productive oil field in the United States east of the Mississippi River. During that time, nearly 27 million barrels of oil were taken out of the ground. In the 1980's another oil deposit was located in the 4,200-foot Richfield formation. This was followed by natural gas finds at the 12,000-foot level.

Today agriculture, manufacturing, and tourism continue as the main economic drivers of the county. The Rifle River is home to six canoe liveries with more than 1,800 canoes that attract tens of thousands of tourists each year. Public boat launch sites at the mouths of the Au Gres River and Pine River and five privately owned marinas with 1,200 boat slips along the county’s shoreline provide boater’s access to the Saginaw Bay. Numerous campgrounds provide campsites for the tens of thousands of tourists that come to Arenac County every summer.

Farming continues to be among Arenac County’s largest industries generating more than \$50 million in gross revenues in 2012. By comparison today, manufacturing industries in the county generate more than \$145 million a year in earnings and tourism accounts for another \$50 million annually. Hospitals and other health care facilities also represent a considerable presence in the county.

### Climate and Weather

CLIMATE		
MONTH	AVG. MIN TEMP	AVG. MAX TEMP.
January	11°F./-12°C.	28°F./-2°C.
July	56°F./13°C.	82°F./28°C
PRECIPITATION	RAINFALL	SNOWFALL
Average Annual	28in./71cm.	45in./114cm.
GROWING SEASON	DAYS ABOVE 90°F/32°C	DAYS BELOW 0°F/-18°C
126 days	8	17

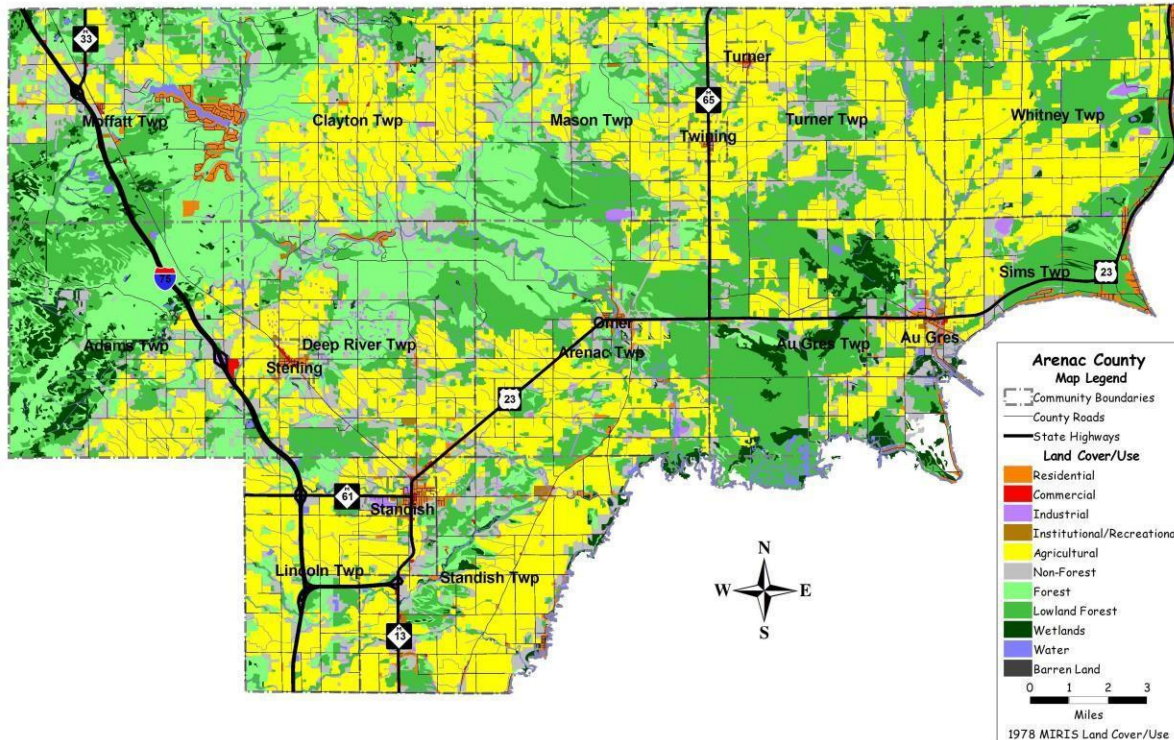
Source: NOAA Climate Summary, 1995

**Table 1**

### Land Use

Arenac County covers 367 square miles or 235,136 acres. Approximately 46% of the land is forest and most of this land is held in trust by the state government as the Au Sable State Forest. These holdings represent significant recreational resources for the County. Approximately 35.87% of the county lands are devoted to agricultural production. Most of the development in Arenac County is located near the City of Standish. Urbanized areas make up approximately 1% of the County’s land area. Forests, inland waters, and wetlands together comprise 49.7% of the County’s surface area. All the townships and cities in Arenac County have prepared individual Land Use and/or Zoning Ordinances except Adams Township.





**Figure 3: 1978 MIRIS Land Cover/Use**

Most of Arenac County is an old lakebed. Small areas consist of ground moraines and water laid moraines. In the lakebed areas, the material ranges from clay-to-clay loam, loam, or sand in texture. In many places, this fine-textured material has been covered by sand that ranges from six inches to many feet in thickness. Deep deposits of sandy material occur throughout the lakebed, but they are predominantly in the northwestern part of the county. Elevation of the lakebed ranges from slightly less than 600 feet to 750 feet above sea level. The soil associations found in the county are listed below.



Figure 4: STATSGO Soils Map of Arenac County

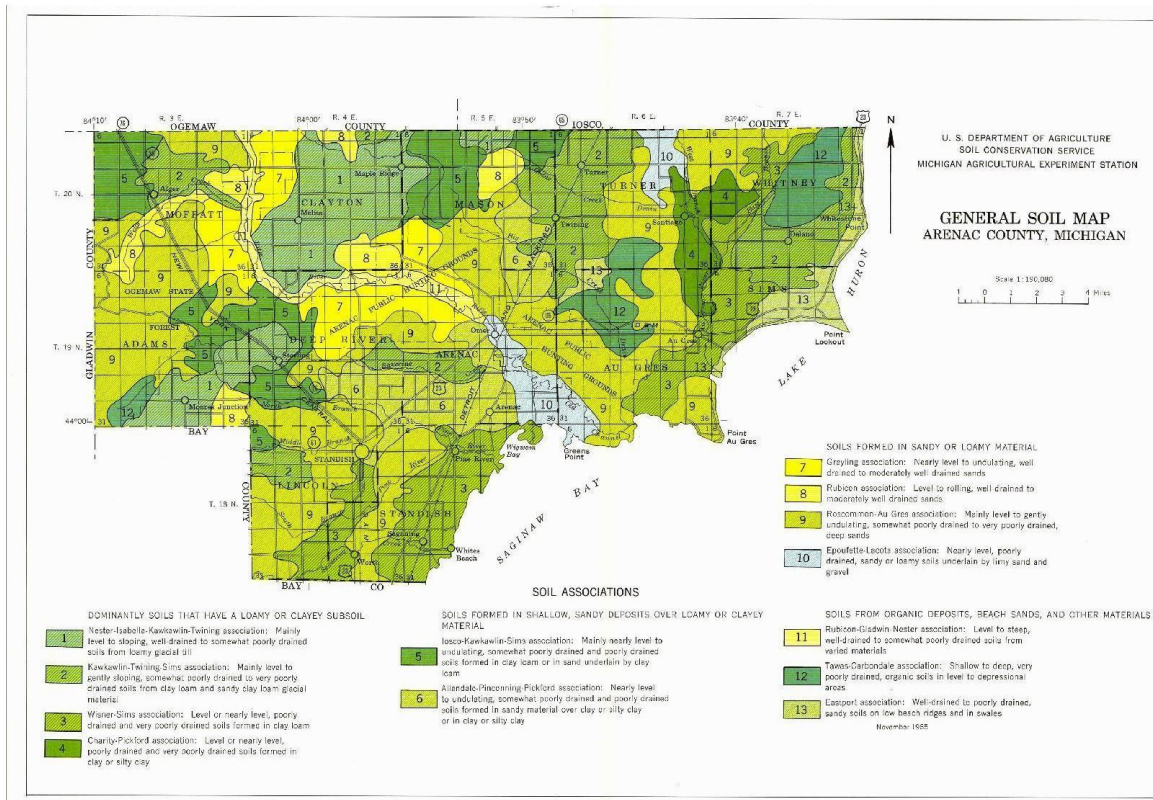


Figure 5: General Soil Map

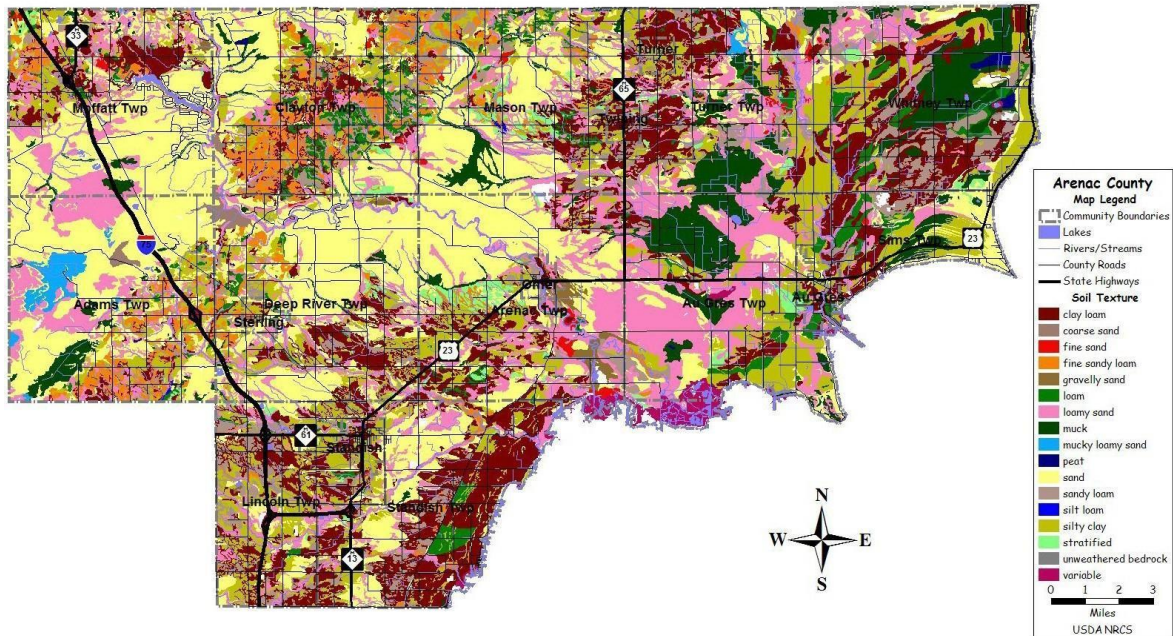


Figure 6: USDA-NRCS Soils Map

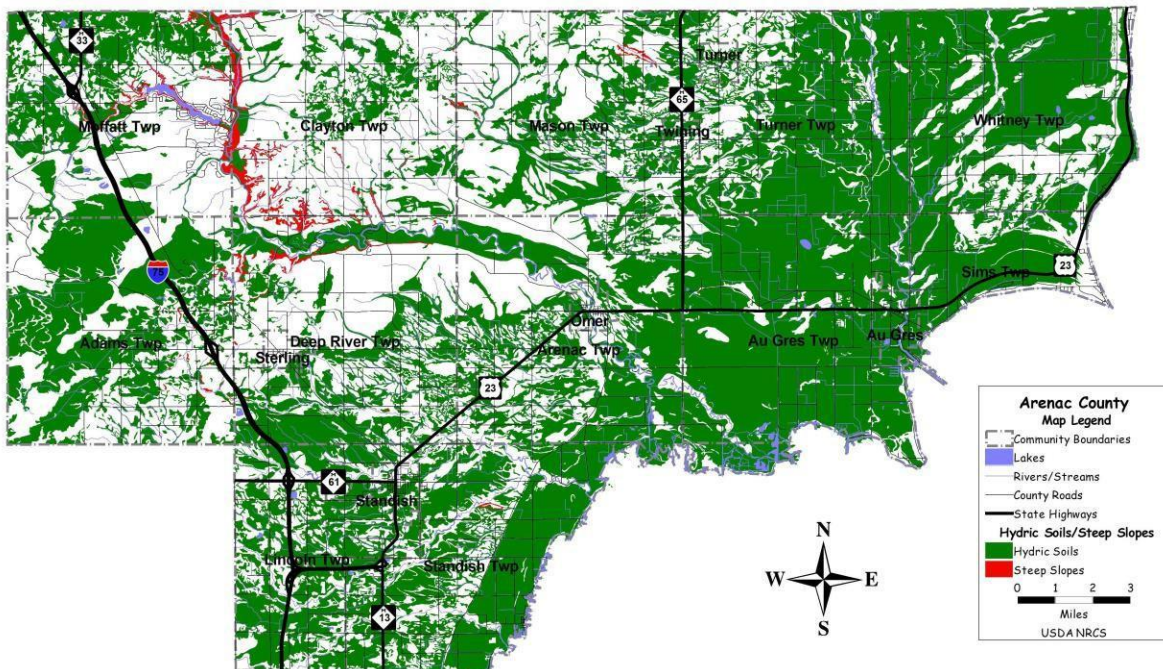


Figure 7: USDA-NRCS Hydric Soils & Steep Slopes Map

## Topography

Arenac County's topography has total relief of about 280 feet with the lower points being along the lakeshore at about 580 feet above sea level. Elevations increase moving in towards the central portion of the county where the highest point is 860 feet above sea level. The terrain in the county varies from flat areas to gently rolling or hilly areas. The most significant relief and topographic features can be seen in the northwest area of the county.

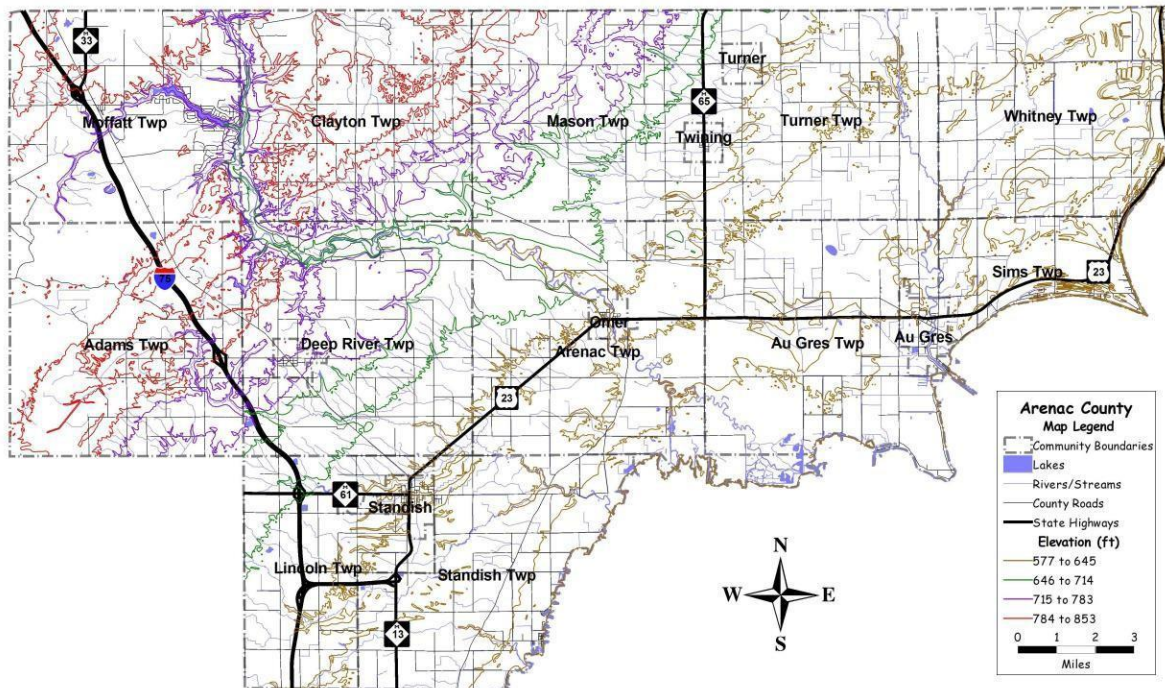


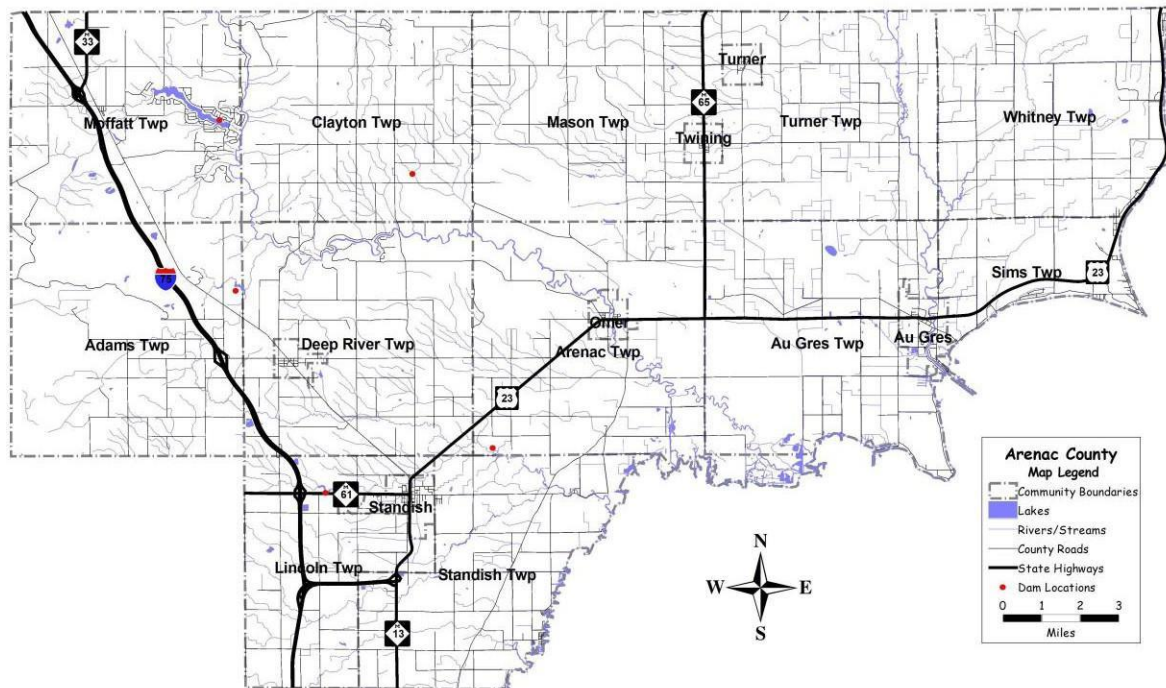
Figure 8: Topography Map

## Hydrology

Arenac County has a variety of water features such as rivers, streams, lakes, and wetlands. The County has about 600 acres of Lake Surface and 8800 acres of wetlands. Together they account for 4% of the county's total acreage.

Eleven lakes are more than ten acres within the county and provide ample opportunity for water related activities such as fishing and boating. The most significant lakes include: Forest Lake, Mud Lake, Lake Charlyle, and Oxbow Lake.

Watersheds within the county are the Pine River Watershed, Rifle River Watershed, Big Creek Watershed, and Au Gres River Watershed. All these rivers drain into the Saginaw Bay of Lake Huron.



**Figure 9: Dam Location Map**

Wetlands are defined by the existence of water, either on or near the surface of the earth for a portion of the year, and by wetland vegetation that is present. Wetlands may have many names and are often referred to as bogs, marshes, and swamps. Wetlands are an important resource for the people of Arenac County. They improve the water quality of lakes and streams by filtering polluting nutrients and chemicals. Wetlands also recharge aquifers, support wildlife and vegetation, and protect shorelines from erosion.

Arenac County has many flood prone areas. The shoreline of Lake Huron is considered flood prone along with the banks of the Rifle River, Au Gres River, and the Pine River. These municipalities are in FEMA’s National Flood Insurance Program: Arenac Township, City of Au Gres, Au Gres Township, Deep River Township, Lincoln Township, Sims Township, City of Standish, Standish Township, Whitney Township, City of Omer, Turner Township, Moffatt Township and Clayton Township.

**Repetitive Loss Assessment??**

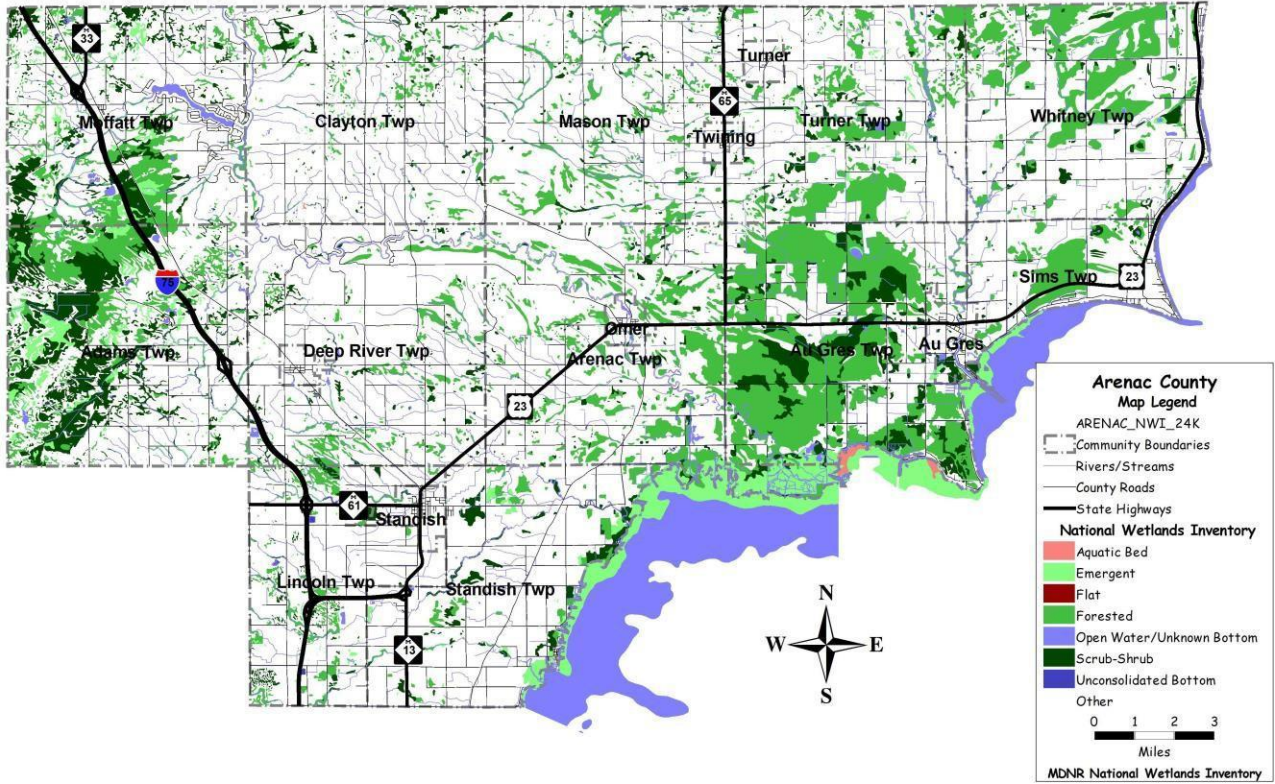
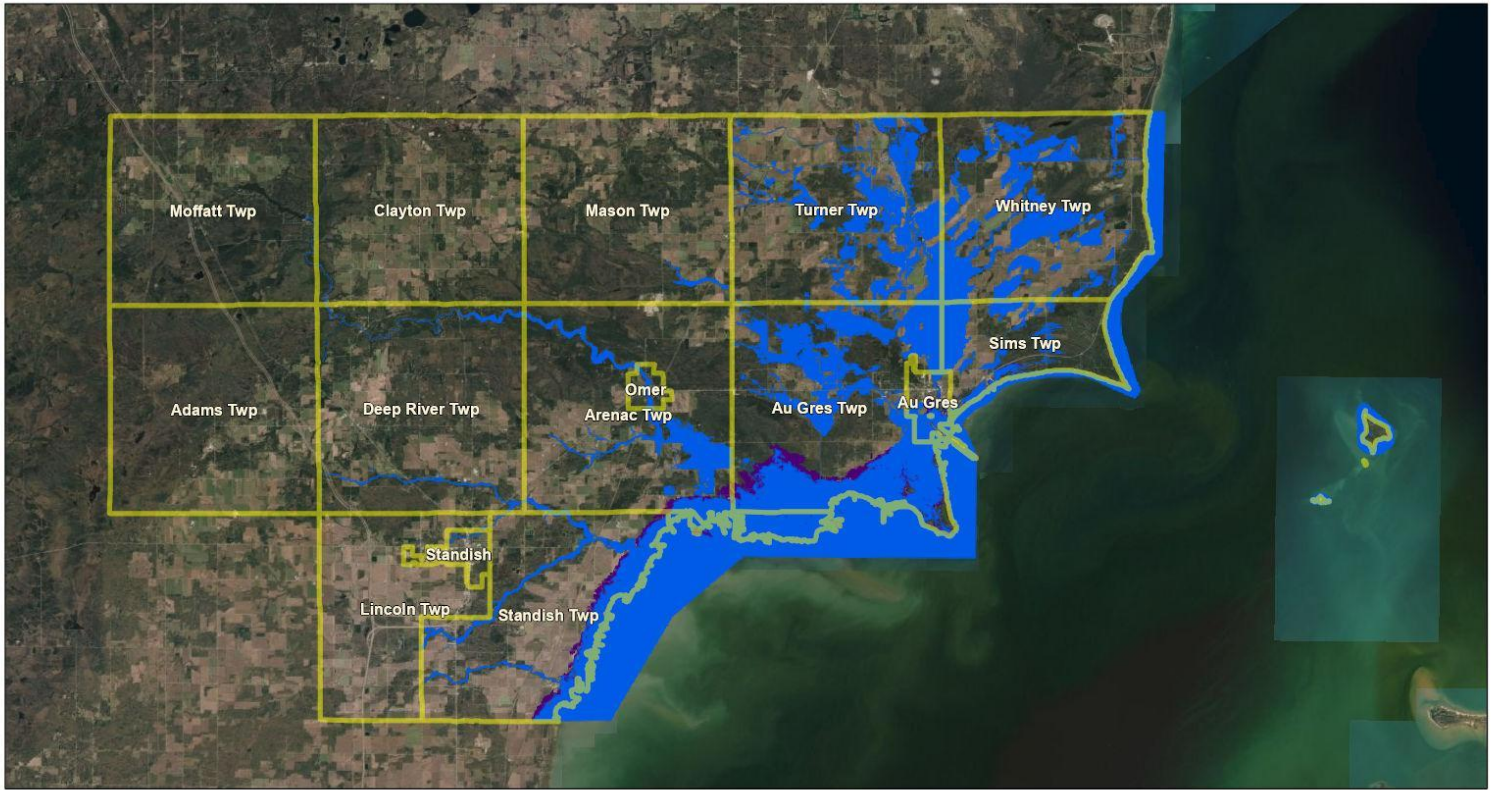


Figure 10: MDNR National Wetlands Inventory

Arenac County Flood Zones



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- 100\_Year(AE)
- 100\_Year(A)

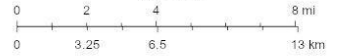
■ 500\_Year(X)

Municipality Boundary

Michigan Best Available (server/rest/services)

- Red: Band\_1
- Green: Band\_2
- Blue: Band\_3

1:238,315



Earthstar Geographics

Figure 11: Arenac County Flood Zones

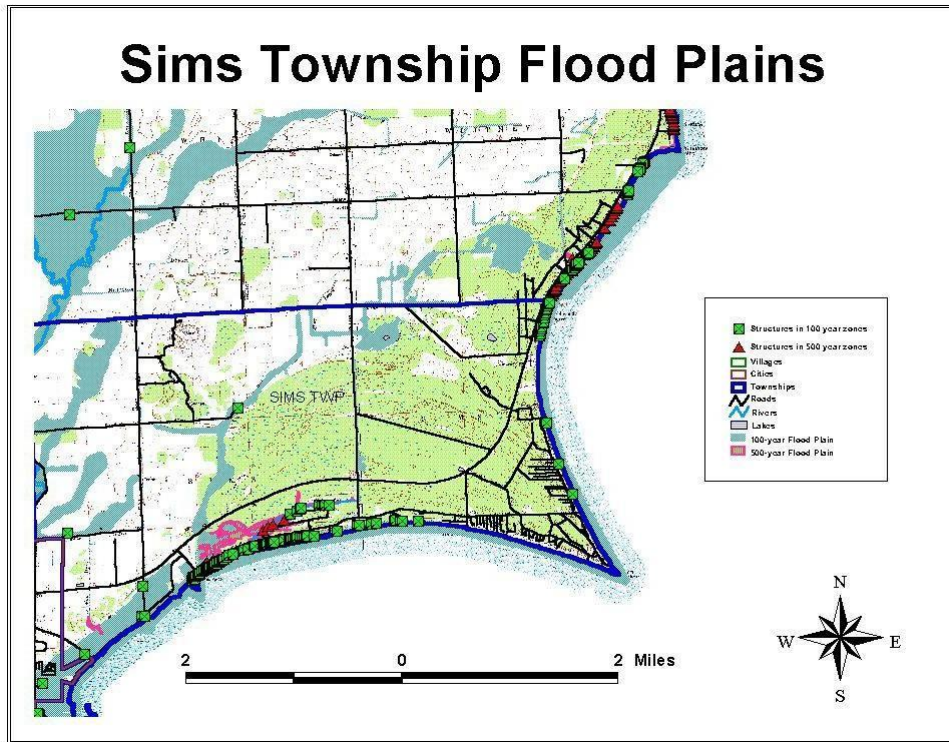


Figure 12: Sims Township Structures in a Flood Plain Map

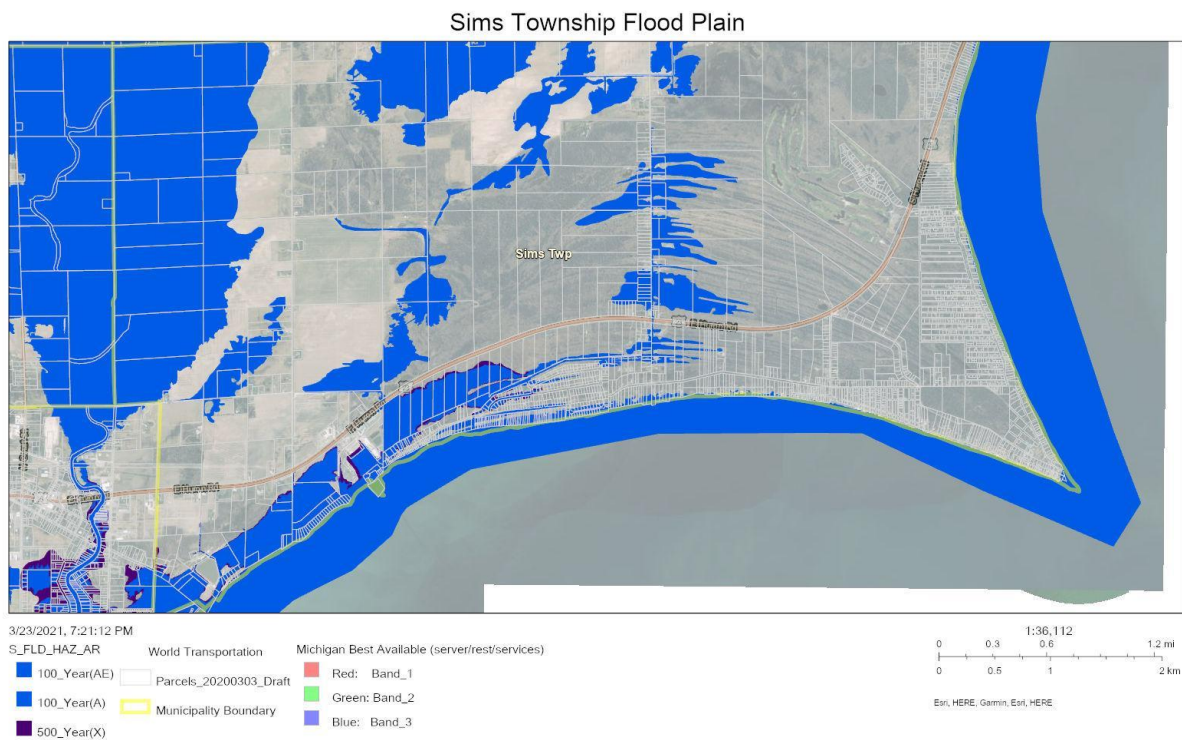


Figure 13: Sim Township Flood Plains 2019



# Omer Flood Plains

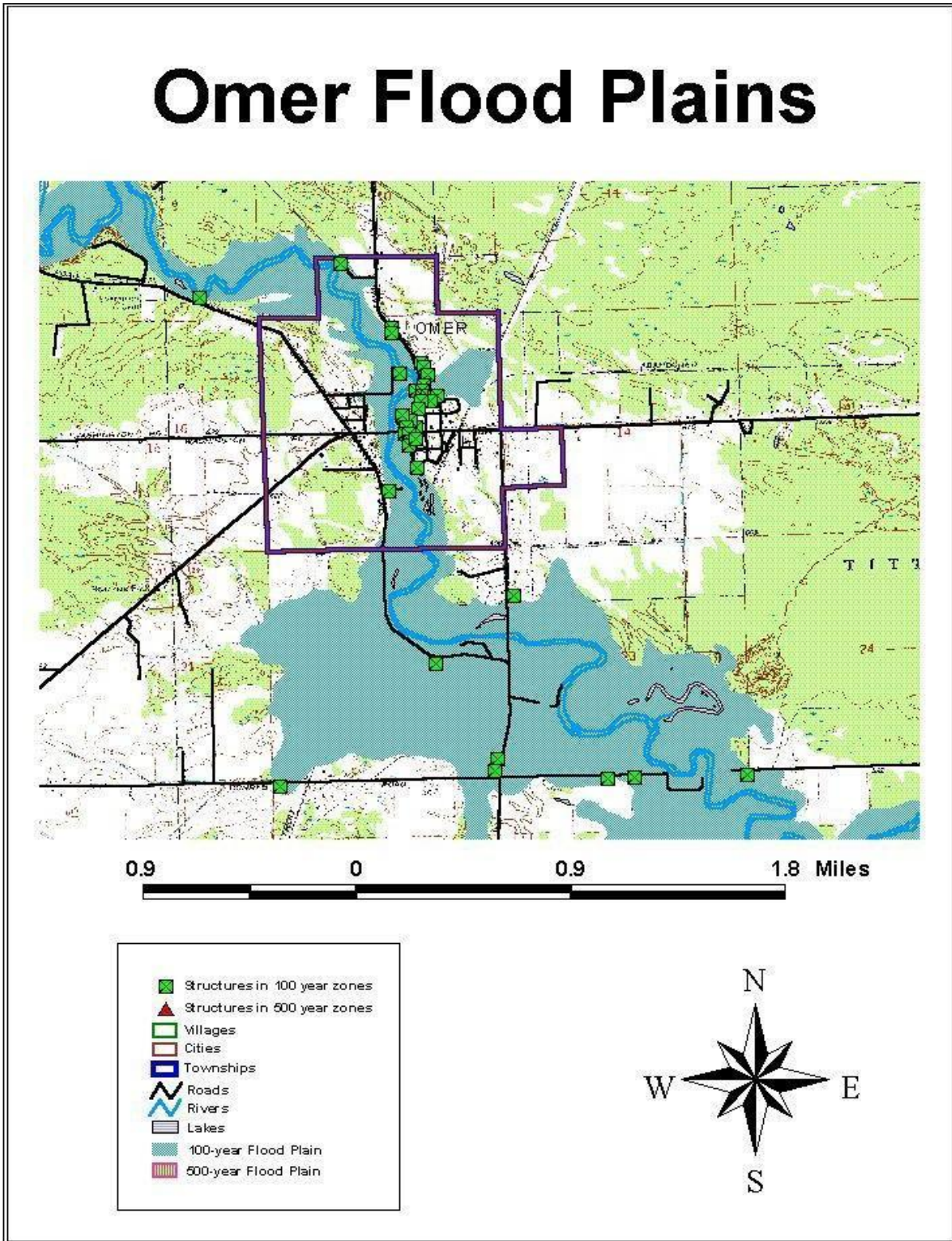
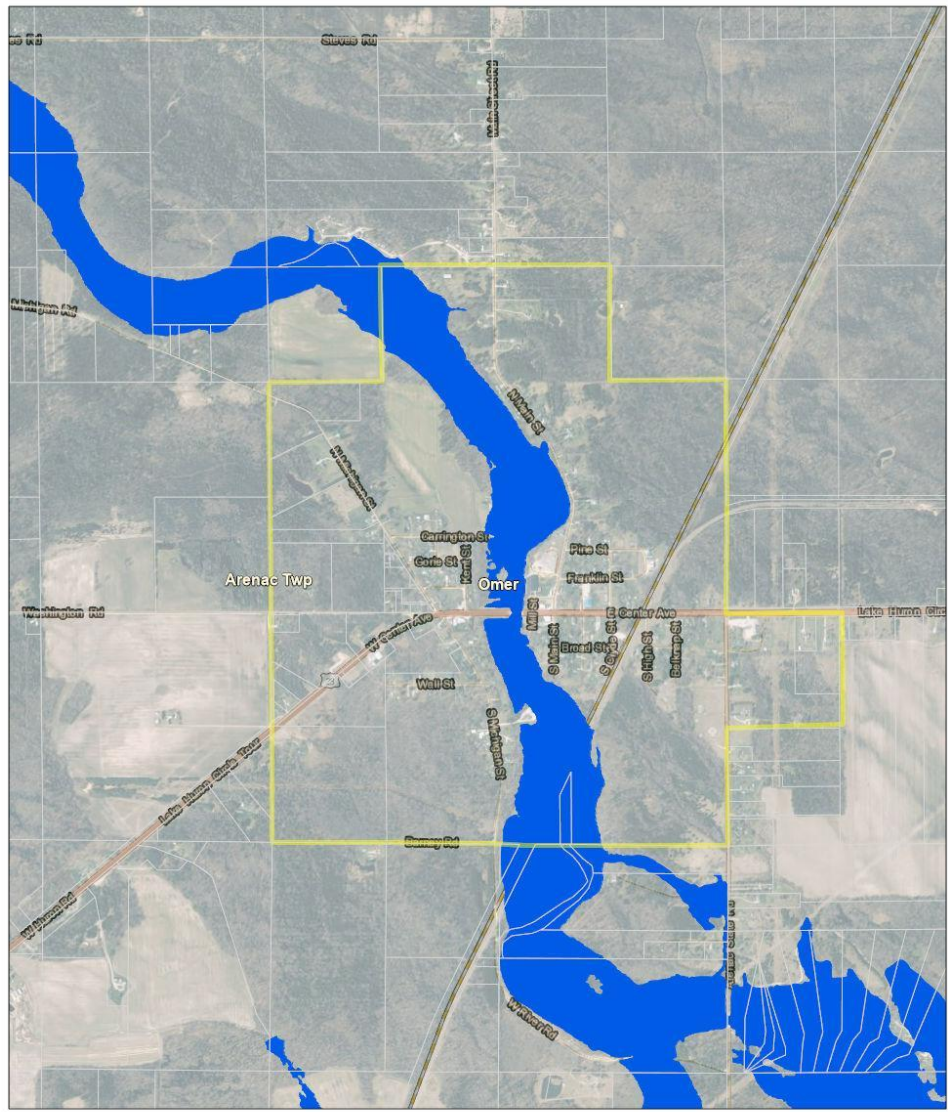


Figure 14: Omer Structures in Flood Zone Map

Omer Flood Plain



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100\_Year(AE)

100\_Year(A)

500\_Year(X)

World Transportation

Parcels\_20200303\_Draft

Municipality Boundary

Michigan Best Available (server/rest/services)

Red: Band\_1

Green: Band\_2

Blue: Band\_3

1:18,056

0 0.13 0.25 0.5 mi  
0 0.23 0.45 0.9 km

Esri, HERE, IFC  
Esri, HERE, Garmin, IFC

Web AppBuilder for ArcGIS

Figure 15: Omer 2019 Flood Plains

# Au Gres Flood Plain

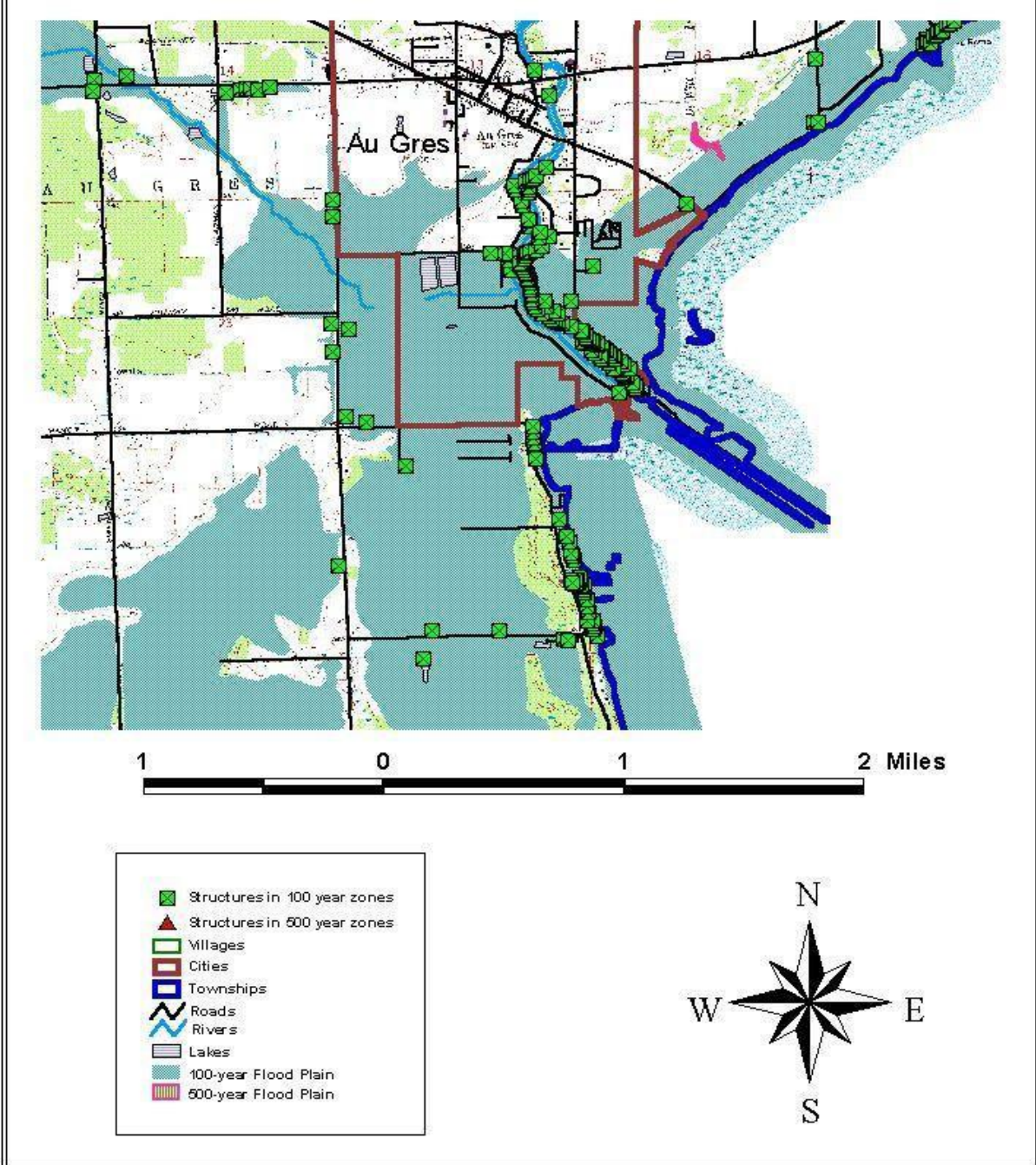
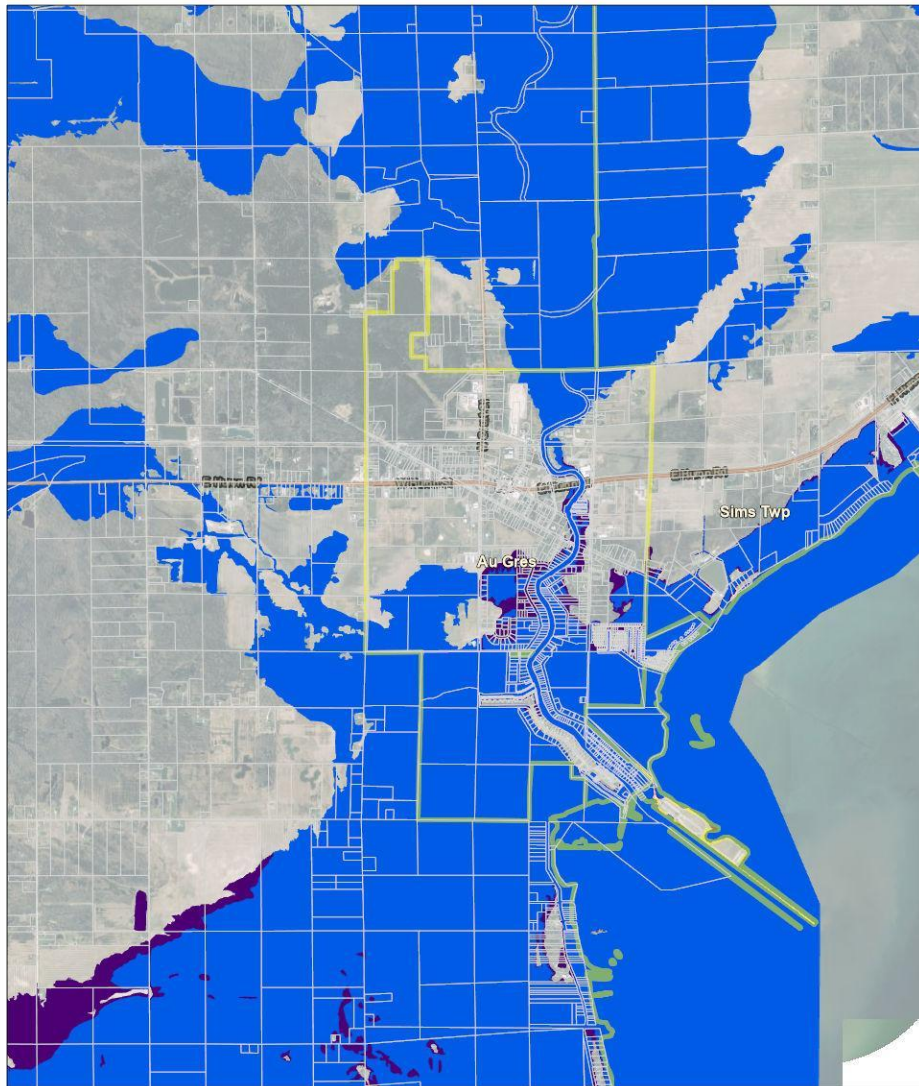


Figure 16: Au Gres Flood Plains

Au Gres 2019 Flood Plain



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100\_Year(AE)

100\_Year(A)

500\_Year(X)

World Transportation

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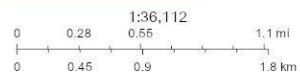
Municipality Boundary

Michigan Best Available (server/rest/services)

Red: Band\_1

Green: Band\_2

Blue: Band\_3



Esri, HERE, Garmin  
Esri, HERE

Web AppBuilder for ArcGIS

Figure 17: Au Gres 2019 Flood Plain

# East Whitney Township Area Flood Plain

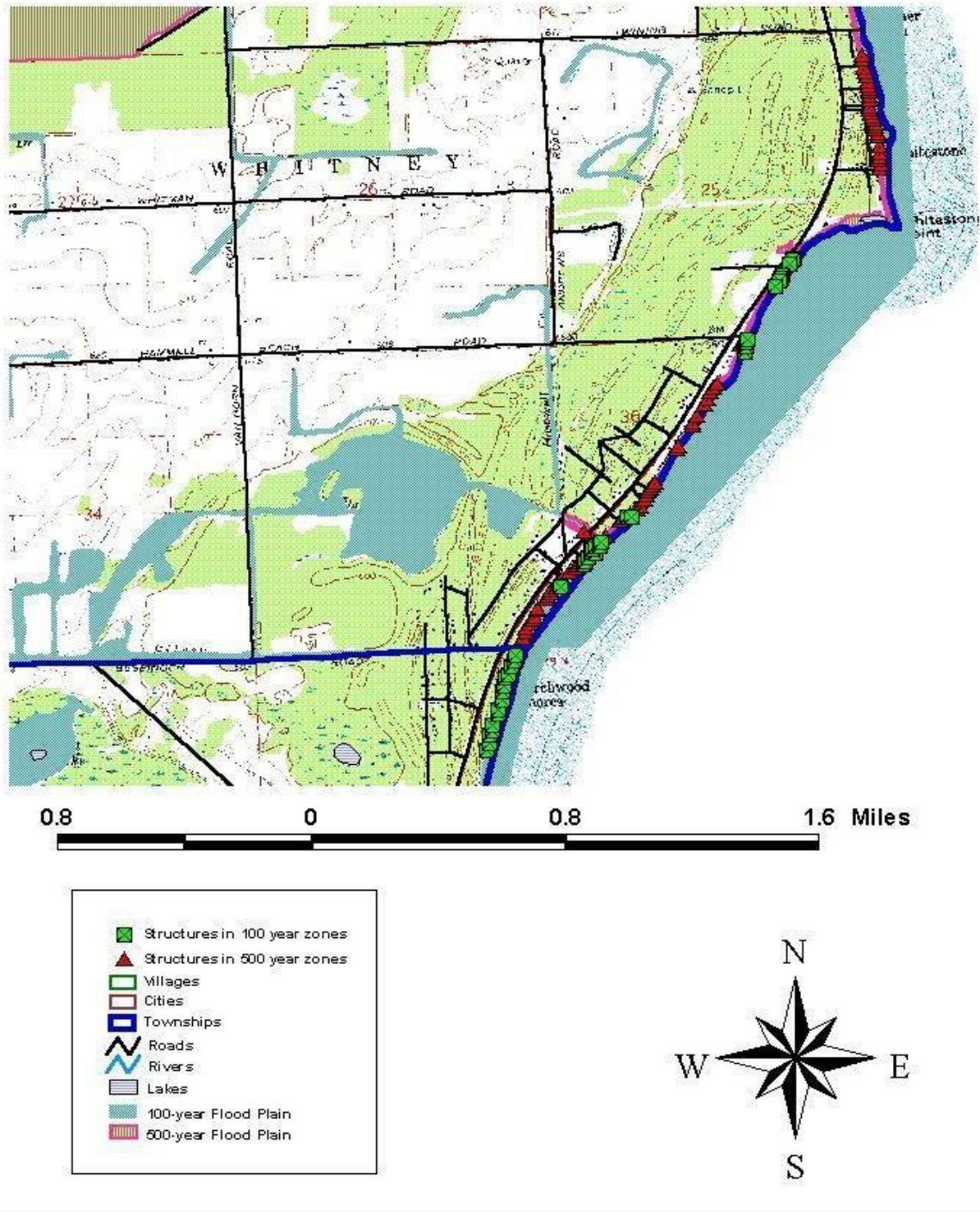
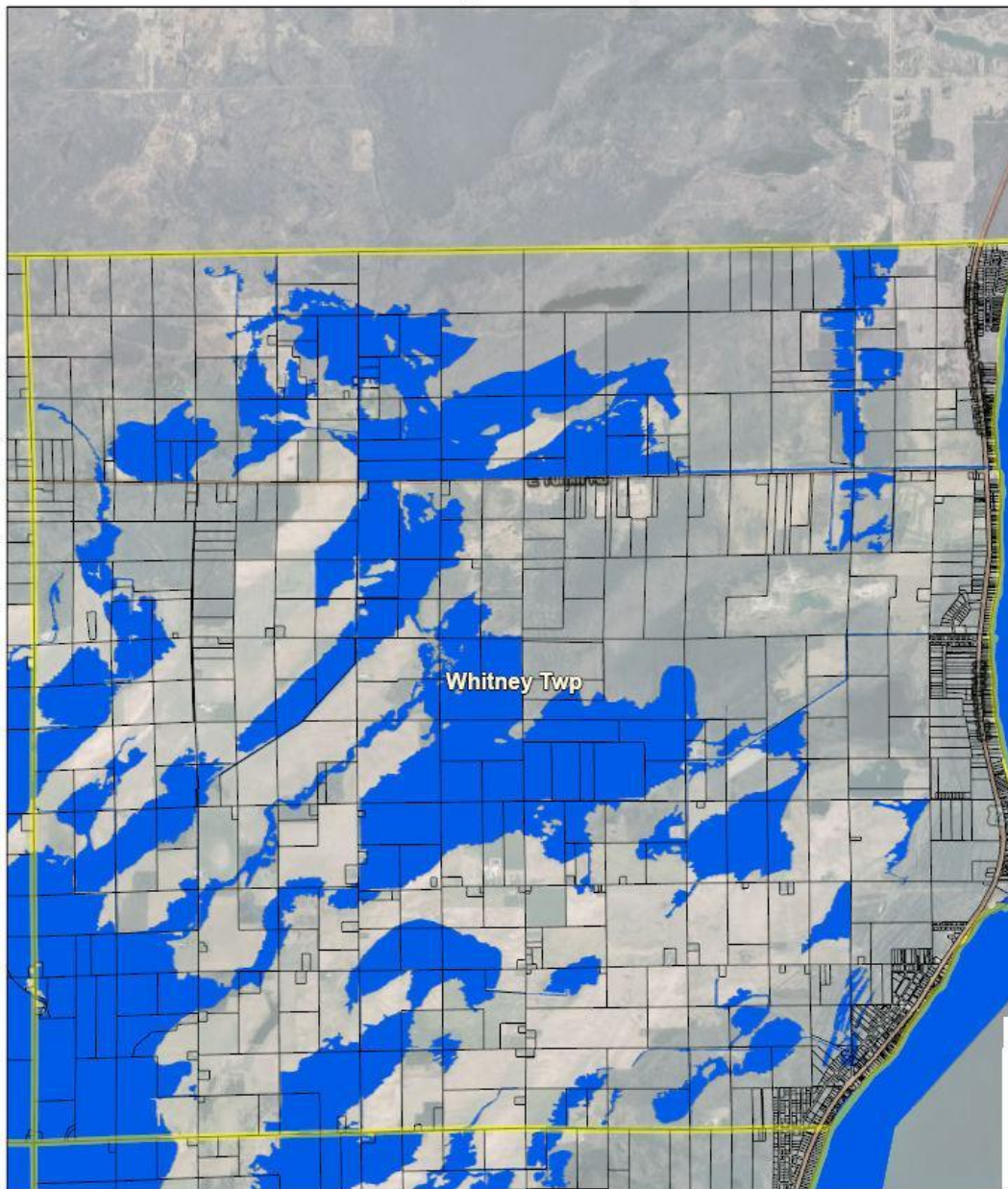


Figure 18: East Whitney Township Flood Plains

East Whitney Flood Map 2019



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100\_Year(AE)

100\_Year(A)

500\_Year(X)

World Transportation

Municipality Boundary

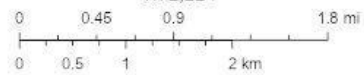
Parcels\_09012021

Michigan Best Available (server/rest/services)

Red: Band\_1

Green: Band\_2

Blue: Band\_3



Esri, HERE, Garmin, Esri, HERE

Web AppBuilder for ArcGIS  
 Earthstar Geographics | Esri, HERE | Esri, HERE, Garmin | source: National Hydrography Dataset, USGS |

Figure 19: East Whitney Township Flood Plains 2019

# Rifle River Flood Plains

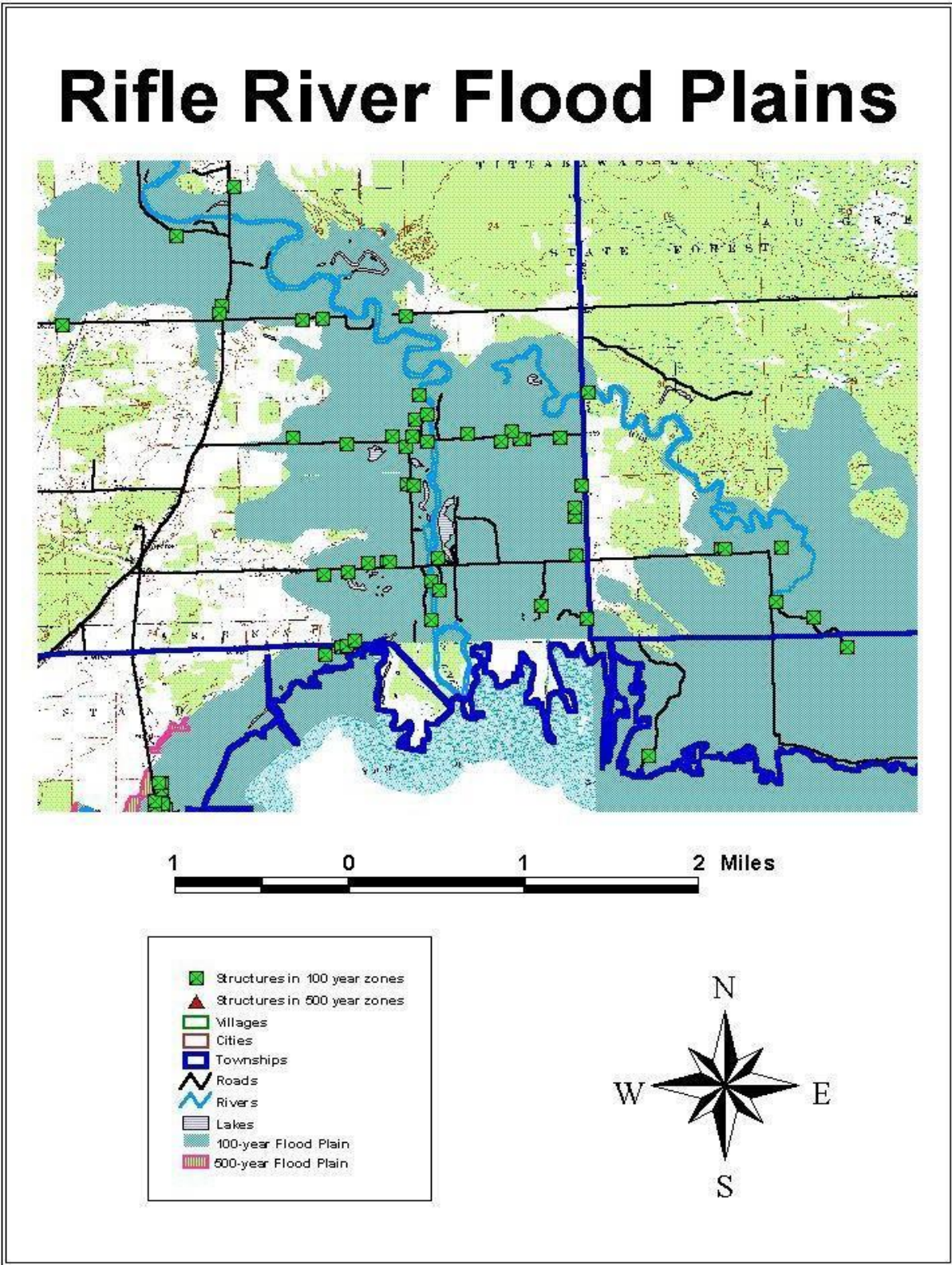
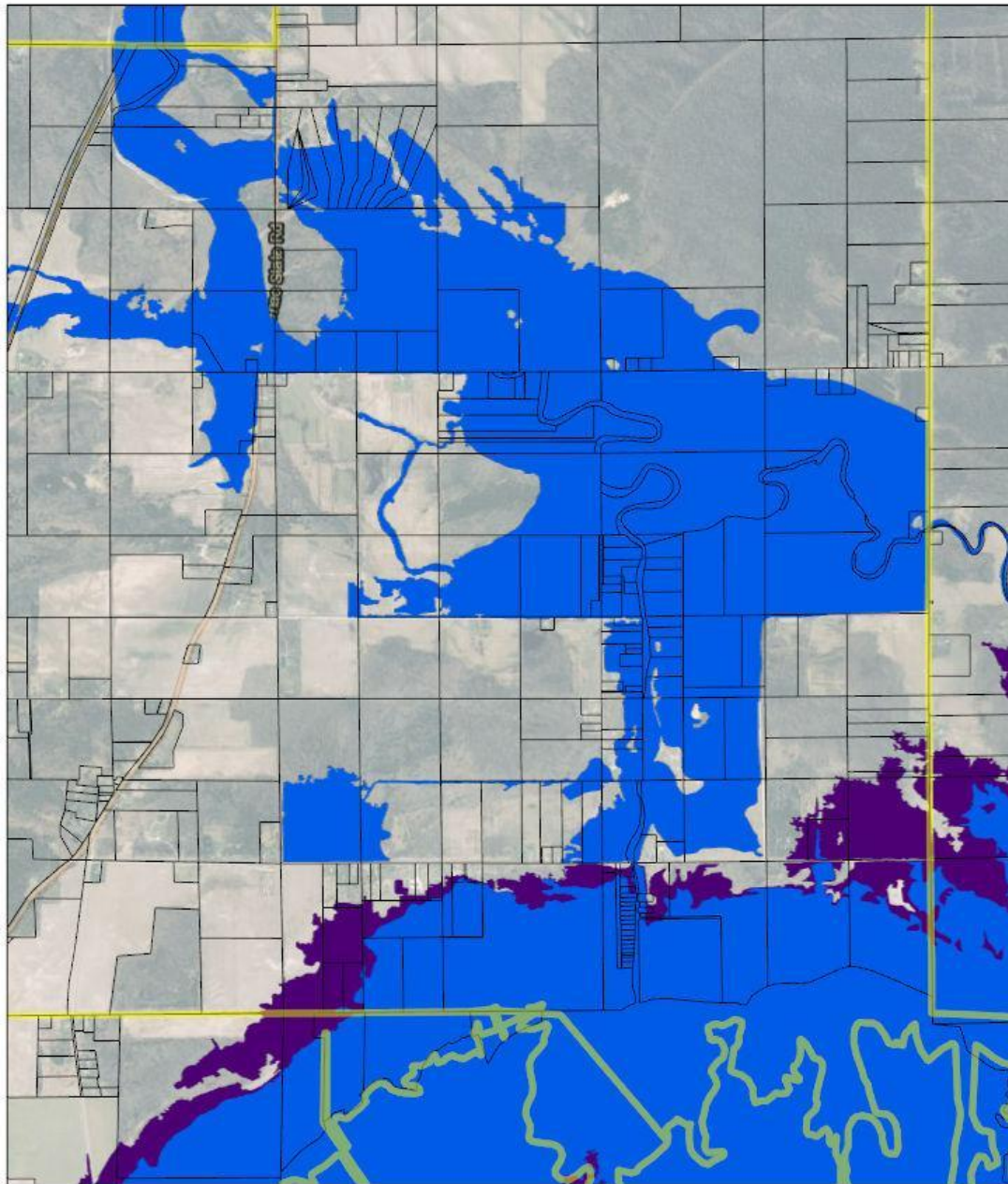


Figure 20: Rifle River Flood Plains

### Rifle River 2019 Flood Plain



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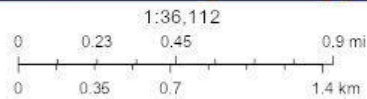
- 100\_Year(AE)
- 100\_Year(A)
- 500\_Year(X)

- World Transportation
- Municipality Boundary

Parcels\_09012021

Michigan Best Available (server/rest/services)

- Red: Band\_1
- Green: Band\_2
- Blue: Band\_3



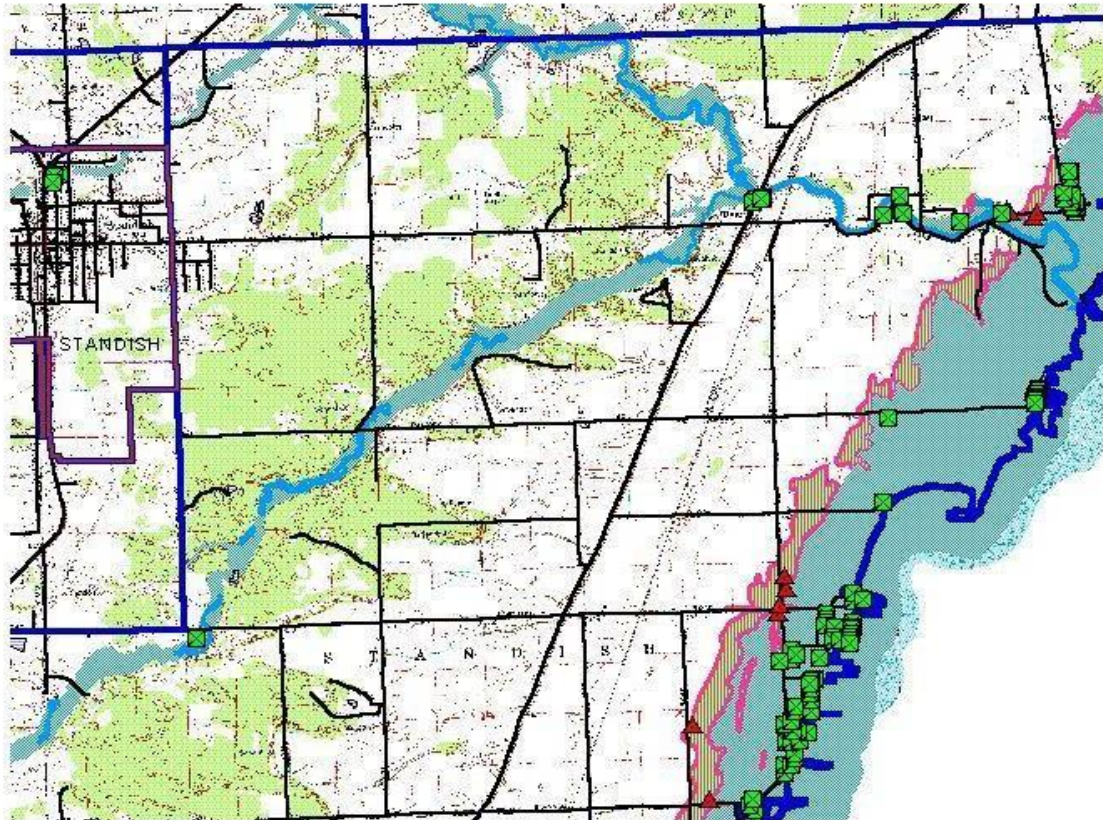
Esri, HERE, Garmin, Esri, HERE

Web AppBuilder for ArcGIS  
Earthstar Geographics | Esri, HERE | Esri, HERE, Garmin | source: National Hydrography Dataset: USGS |

**Figure 21: Rifle River Flood Plains 2019**



# Standish Pine River Area Flood Plains



1 0 1 2 Miles

- Structures in 100 year zones
- Structures in 500 year zones
- Villages
- Cities
- Townships
- Roads
- Rivers
- Lakes
- 100-year Flood Plain
- 500-year Flood Plain

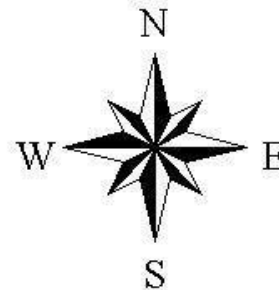
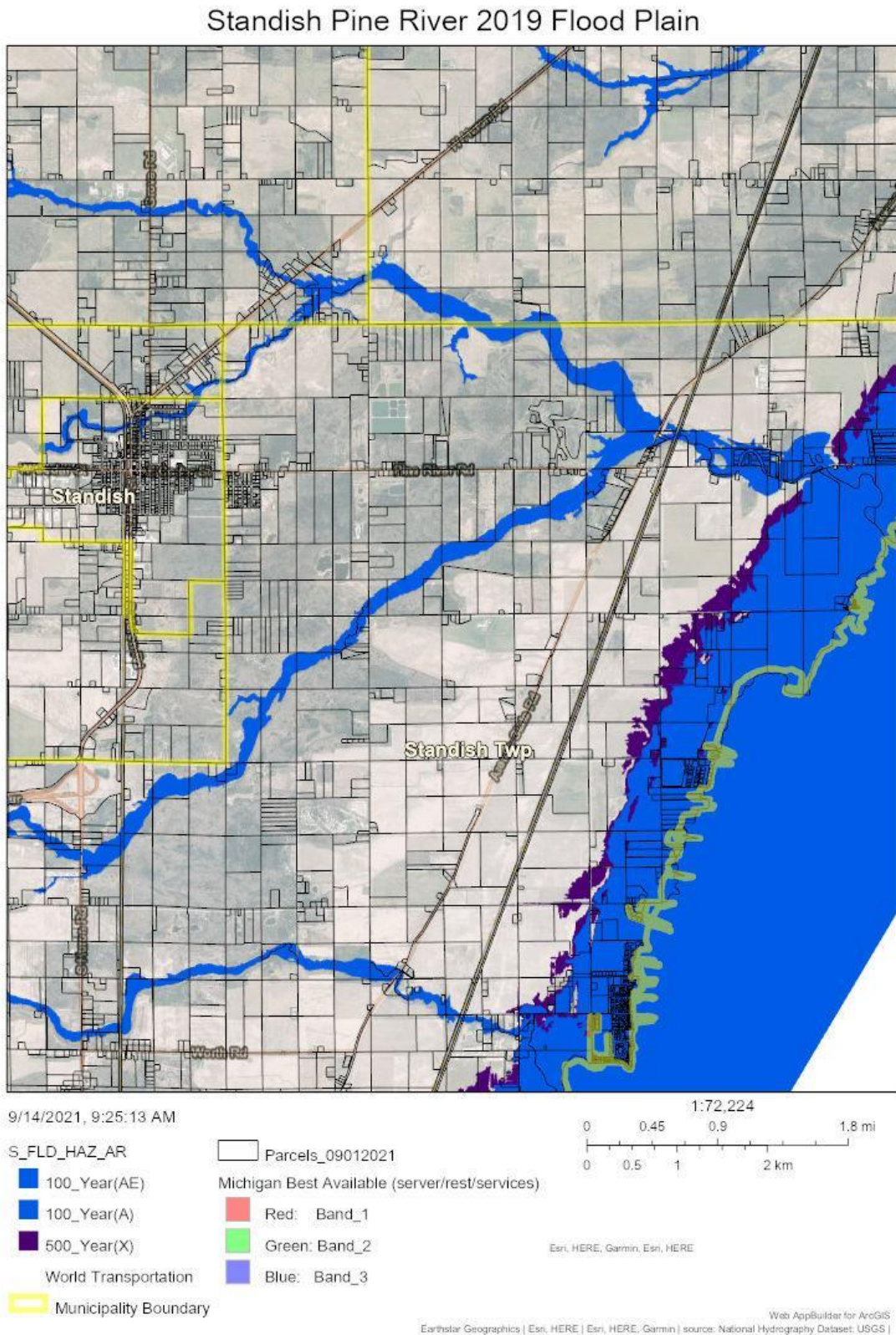


Figure 22: Standish Pine River Area Flood Plains



**Figure 23: Standish Pine River Area Flood Plains 2019**

# Turner Township Flood Plains

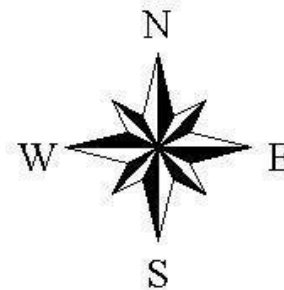
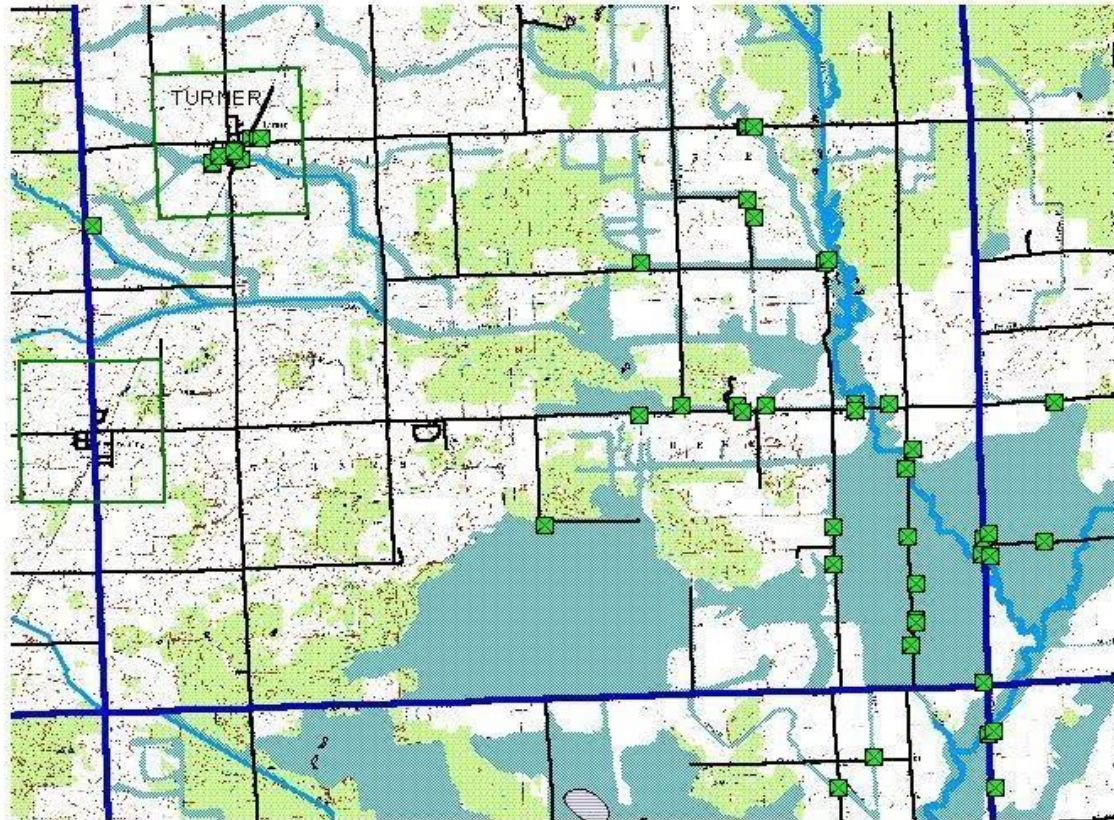
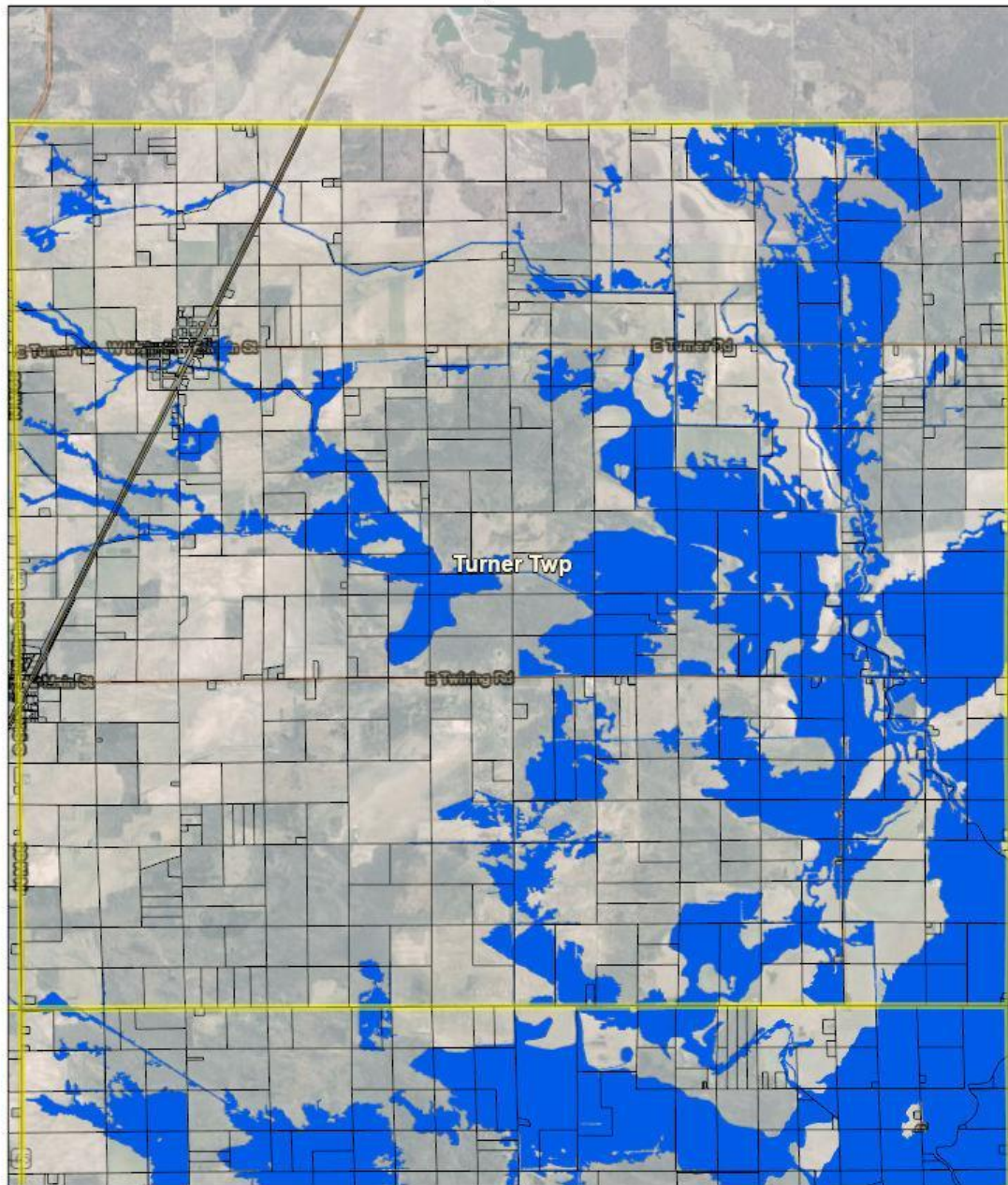


Figure 24: Turner Township Flood Plains

### Turner Township 2019 Flood Plain



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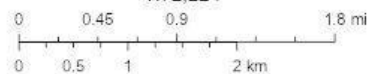
1:72,224

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- 100\_Year(AE)
- 100\_Year(A)
- 500\_Year(X)

- World Transportation
- Municipality Boundary

- Parcels\_09012021
- Michigan Best Available (server/rest/services)
- Red: Band\_1
- Green: Band\_2
- Blue: Band\_3



Esri, HERE, Garmin, Esri, HERE

Web AppBuilder for ArcGIS  
 Earthstar Geographics | Esri, HERE | Esri, HERE, Garmin | source: National Hydrography Dataset: USGS |

**Figure 25: Turner Township Flood Plains**

Clayton Township 2019 Flood Plain

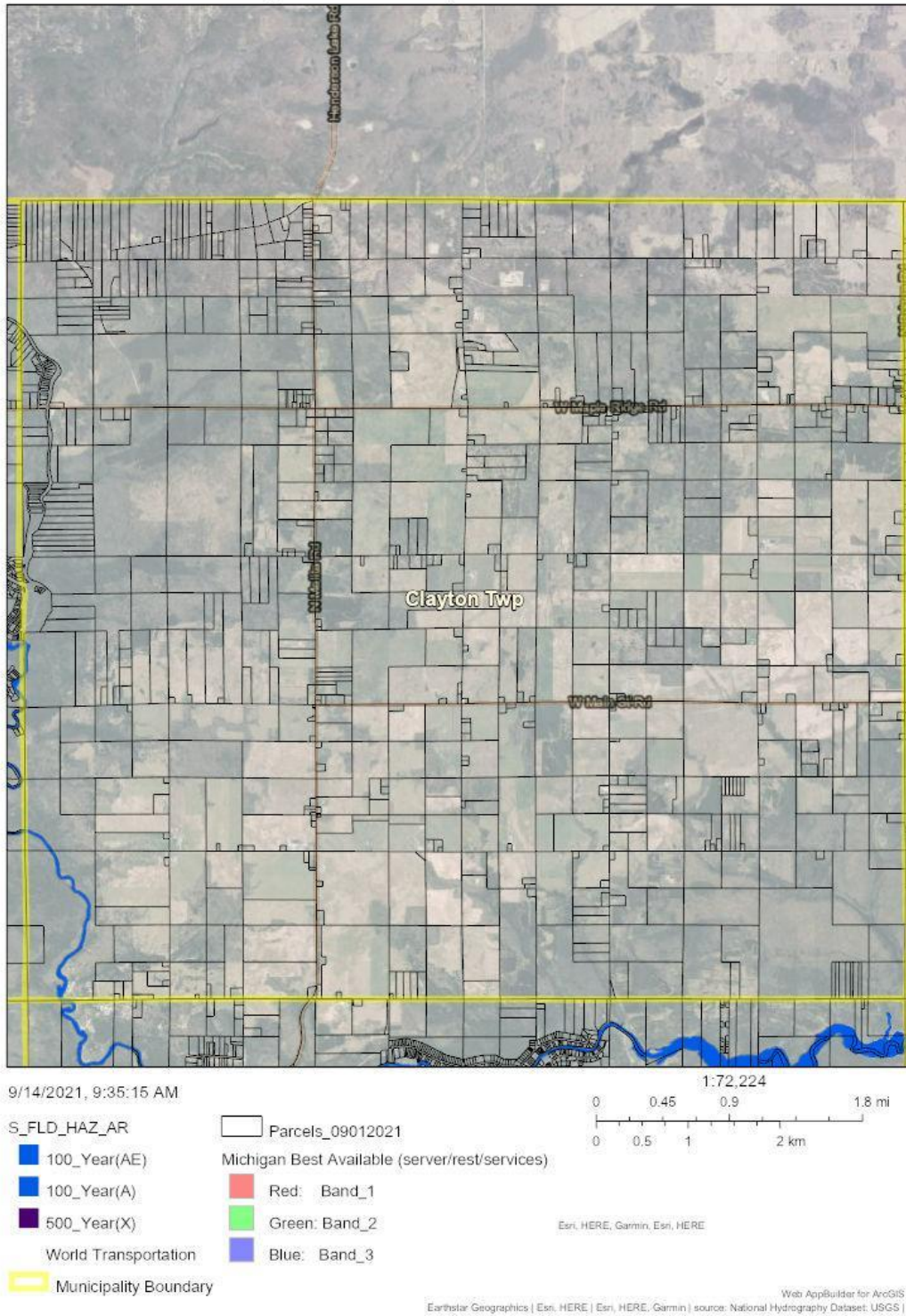
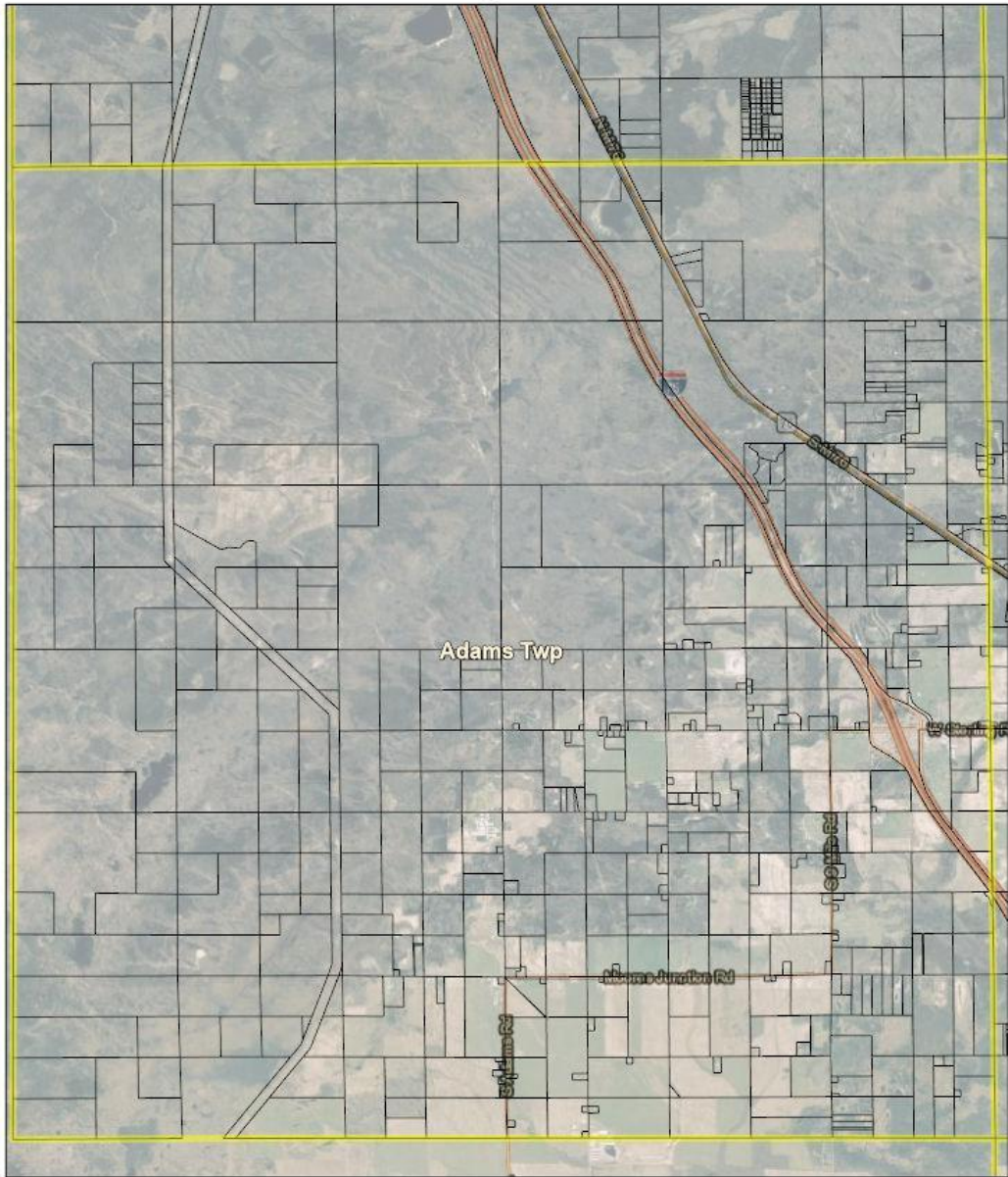


Figure 26: Clayton Township Flood Plains

Adams Township 2019 Flood Plain



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S\_FLD\_HAZ\_AR

- 100\_Year(AE)
- 100\_Year(A)
- 500\_Year(X)

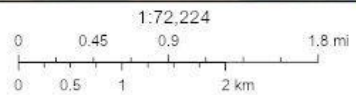
World Transportation

Municipality Boundary

Parcels\_09012021

Michigan Best Available (server/rest/services)

- Red: Band\_1
- Green: Band\_2
- Blue: Band\_3



Esri, HERE, Garmin, Esri, HERE

Web AppBuilder for ArcGIS  
 Earthstar Geographics | Esri, HERE | Esri, HERE, Garmin | source: National Hydrography Dataset, USGS |

Figure 27: Adams Township Flood Plains

Lincoln Township 2019 Flood Plain

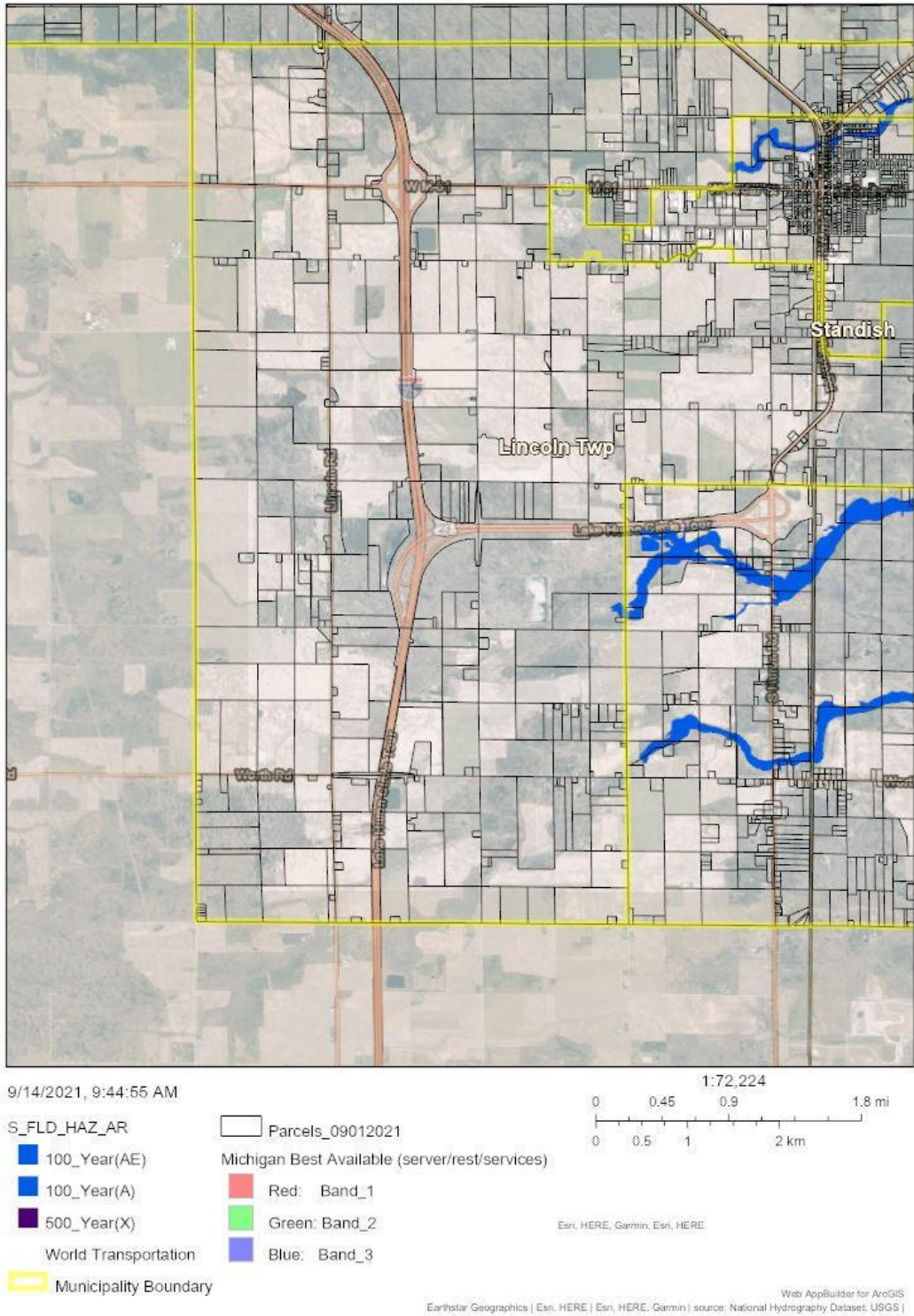
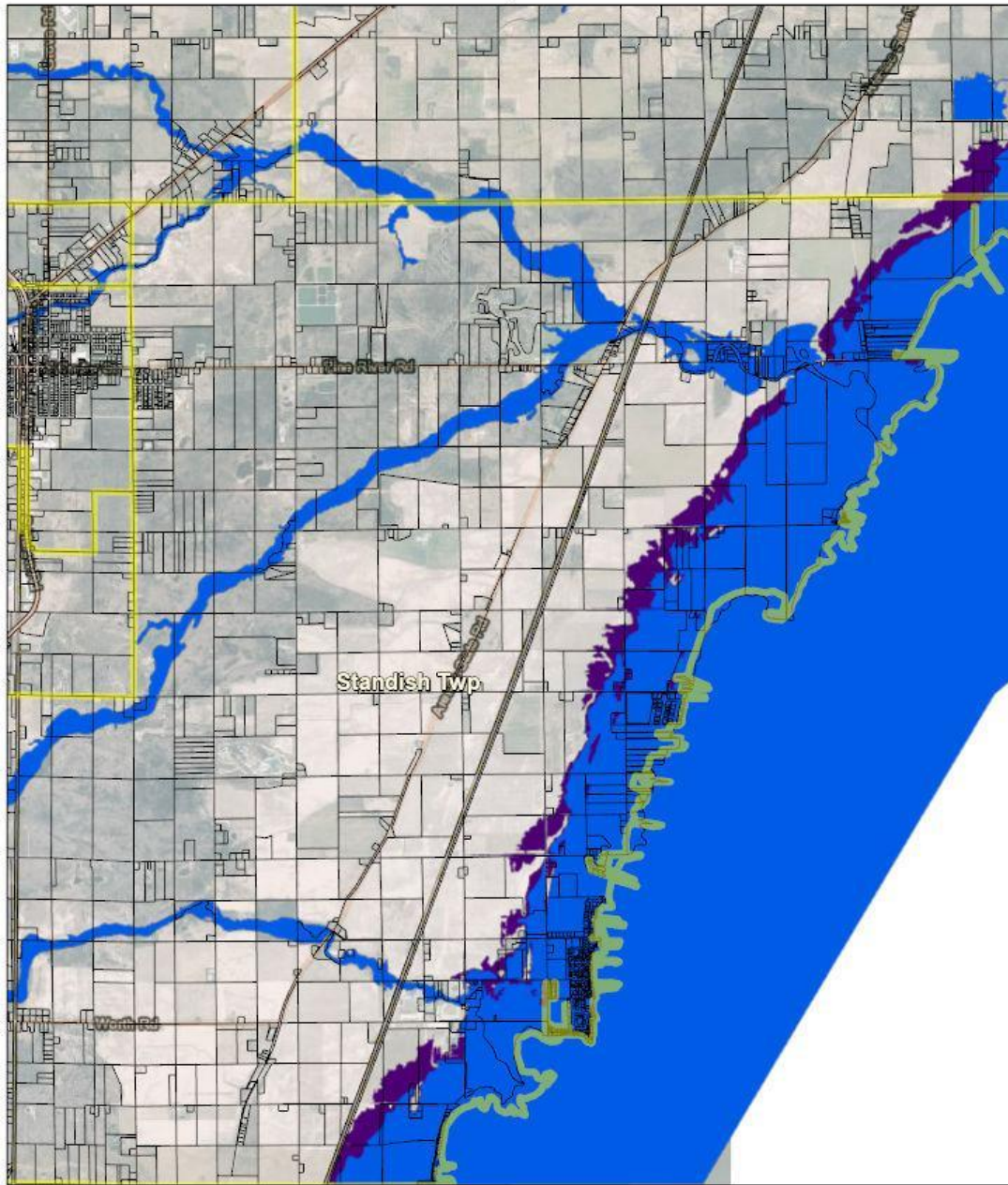


Figure 28: Lincoln Township Flood Plains 2019

### Standish Township 2019 Flood Plain



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100\_Year(AE)

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500\_Year(X)

World Transportation

Municipality Boundary

Parcels\_09012021

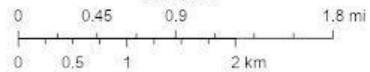
Michigan Best Available (server/rest/services)

Red: Band\_1

Green: Band\_2

Blue: Band\_3

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Esrri, HERE, Garmin, Esri, HERE

Web AppBuilder for ArcGIS  
 Earthstar Geographics | Esri, HERE | Esri, HERE, Garmin | source: National Hydrography Dataset: USGS |

**Figure 29: Standish Township Flood Plains 2019**



## Geology

The rolling hills, river valleys, swamps and lakes of Arenac County were created by the retreating continental glacier 12,000 years ago. Beneath this thick mantle of the glacial deposits lays a foundation of layered sedimentary bedrock.

### Surface Geology

Starting some 2 million years ago, during the Pleistocene era, continental glaciers formed in the Hudson Bay area. Several times, over this two-million-year period, the massive sheets of ice built up and inched their way south across what is today Michigan. The massive ice sheets, more than one mile thick, advanced in a southerly direction, bulldozing their way across the landscape. The glacier pushed material in front of it, incorporated rocks, and soil into the debris laden ice, and scraped, ground and broke apart the sedimentary bedrock of the Michigan Basin.

Each advance and retreat of the continental glaciers took tens of thousands of years. This reoccurring process shaped and reshaped the land, obliterating and then creating hills, valleys, rivers and lakes, swamps, and marshes. The last glacial period, called the Wisconsin era, created the landscape we know today. The glacier left behind boulders, rocks, cobble, sand, gravel, silt, clay, and loam. In some areas, the material was deposited in unsorted masses called till plains, ground moraines and end moraines. Water flowing from the melting glaciers also formed outwash channels, sand deltas, kames, and eskers. Fine materials, captured in the fast-moving glacial meltwater, settled to the bottom of expansive glacial lakes creating lacustrine clay and silt plains.

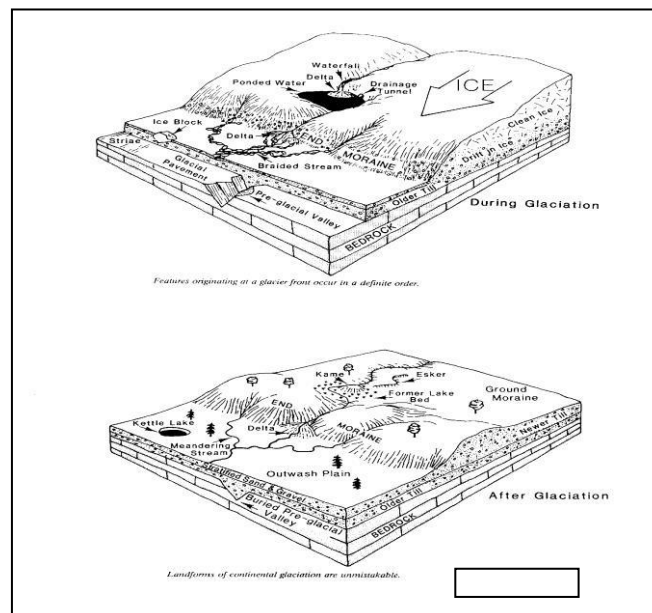


Figure 30: Glacial Land Formations

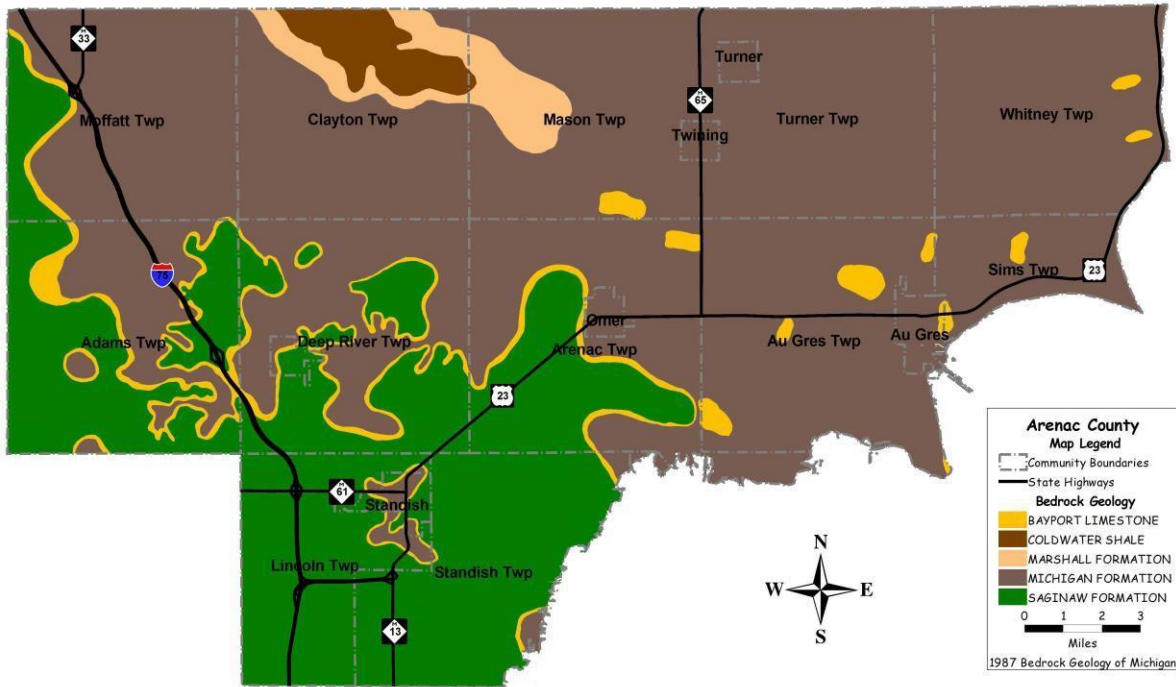


Figure 31: 1987 Bedrock Geology of Michigan

## Pre-settlement Vegetation

The Michigan Department of Natural Resources (MDNR) has compiled pre-settlement vegetation maps of counties in Michigan. The maps were generated from information contained in the first government land survey notes in the 1800's along with information such as current vegetation, landforms and soils. A review of the pre-settlement vegetation map below of Arenac County shows extensive areas were covered with beech-sugar-maple-hemlock and hemlock-white pine. The map delineates jack pine-red pine forest covered as a small area in the middle of the county. In the late 1800's extensive logging and subsequent wildfires resulted in the conversion of hemlock-white pine and beech-sugar maple-hemlock forests to farmland or urban areas. This is most noticeable in the southern portion of the county.

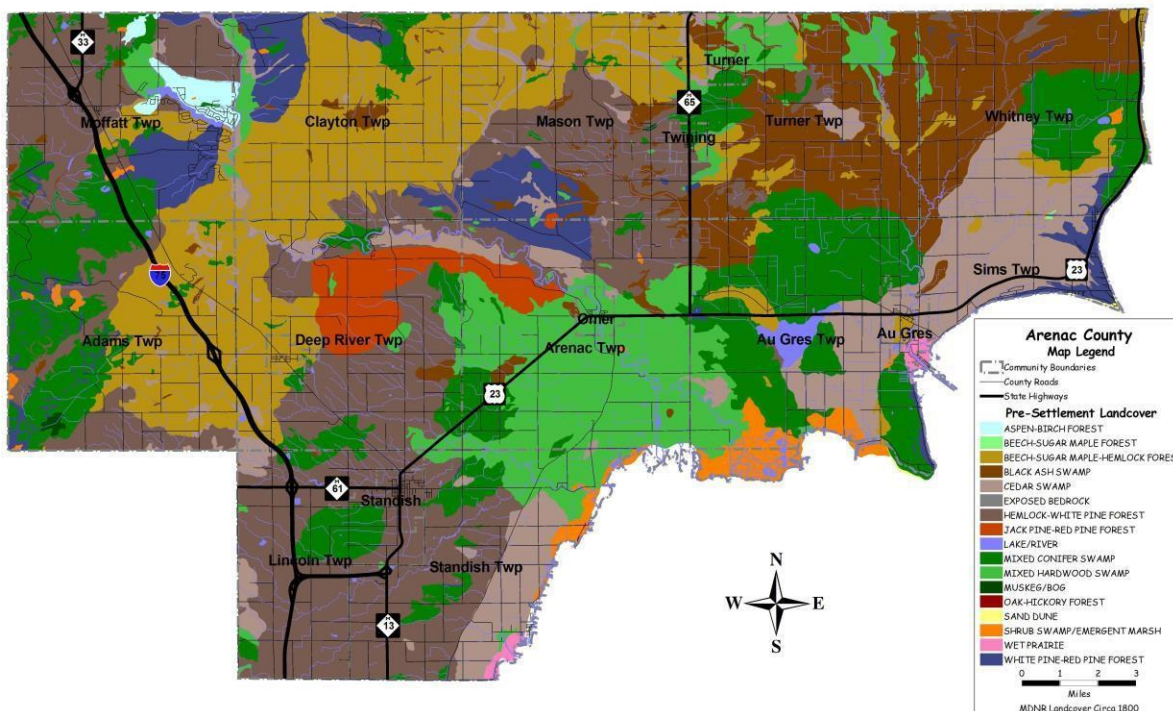


Figure 32: MDNR Land Cover CIRA 1800

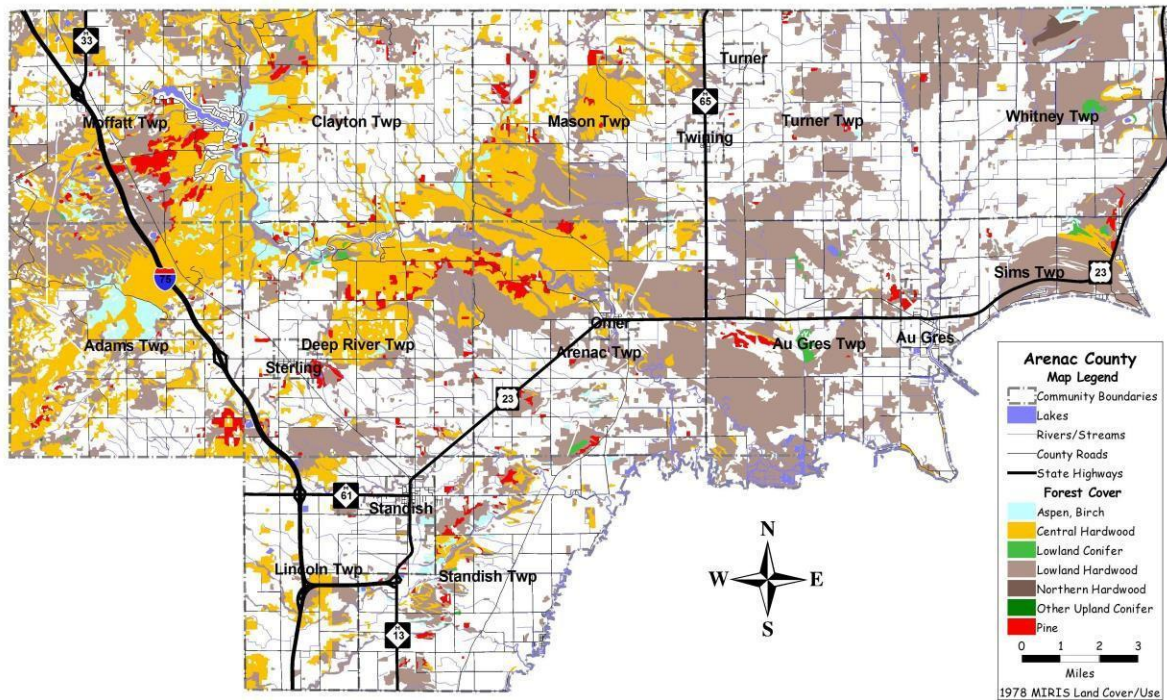
## Forest Cover

Forty-five percent (45.7%) of Arenac County is forested. The Michigan Resource Information System's (MIRIS) 1978 land use inventory compiled land cover maps that depict forest types in the county (Figure 22). Tree species vary depending upon the soils, moisture, and past activities such as logging, fires, and land clearing. Aspen-Birch, central hardwoods, and pine are the most common forest types. Under dry spring conditions forest fires can occur in any forests type. However, some forest types have higher risks. Jack and red pine forests have a high risk for wildfires. Oak and white pine forests have a moderate risk for wildfires. Draughty, low fertility sandy soils, found in outwash plains and channels, supported pre-settlement pine forests that for thousands of years were perpetuated by wildfires. Today, residential development has occurred within the same wildfire prone areas. There is

a concentration of pine forest types in Adams, Arenac, Au Gres, Clayton, Deep River, Mason, and Moffatt Townships.

Red jack and white pine forest types are included in the pine forest category. Bigtooth aspen, quaking aspen, white birch, red maple, and red oak are the primary tree species found in the aspen-birch type. Red oak, white oak, black oak, and northern pin oak are the primary species growing in the oak forests. Northern hardwoods include species such as sugar maple, red maple, American beech, basswood, and yellow birch.

Poorly drained, lowland areas support northern white cedar, tamarack, balsam fir, black spruce, eastern hemlock, white pine, balsam poplar, trembling aspen, paper birch, black ash, speckled alder, and shrub willows. Northern white cedar dominates the wetland areas where there is good lateral water movement, and the soils are high in organic content. Lowland forests are typically located adjacent to water bodies and function as riparian forests and water quality buffers. The network of lowland forests, associated with rivers and creeks, also function as wildlife corridors and are the backbone of large regional ecological corridors. Lowland forests adjacent to the Great Lakes are prone to flooding during periods of high lake levels. Lowland forests adjacent to rivers and streams are prone to flooding during the spring snowmelt, particularly when combined with heavy spring rains. Extensive areas of lowland forests can be found along the Rifle River with large areas scattered throughout the county.



**Figure 33: 1978 MIRIS Forest Cover Map**

<u>Total Area</u>	<u>235,136 acres</u>
Water Areas	4,232 acres
Land Surface	233,904 acres

The following uses of land surface were shown:

Cropland	74,400 acres
Pasture and Idle Grassland	16,000 acres
Rural Transportation	7,800 acres
Forest Land (non-federal)	113,500 acres
Other Rural Land	12,900 acres
Urban Land	8,900 acres
Federal Land	100 acres

### Contaminated Sites

The Michigan Environmental Response Act (Part 201 of PA 451 of 1994, as amended) provides for the identification, evaluation, and risk assessment of sites of environmental contamination in the State of Michigan. The Environmental Response Division (ERD) is charged with administering this law. A site of environmental contamination, as identified by ERD, is “a location at which contamination of soil, ground water, surface water, air or other environmental resource is confirmed, or where there is potential for contamination of resources due to site conditions, site use or management practices.” A search of the Department of Environmental Quality’s web site database found 20 sites of environmental contamination in Arenac County.

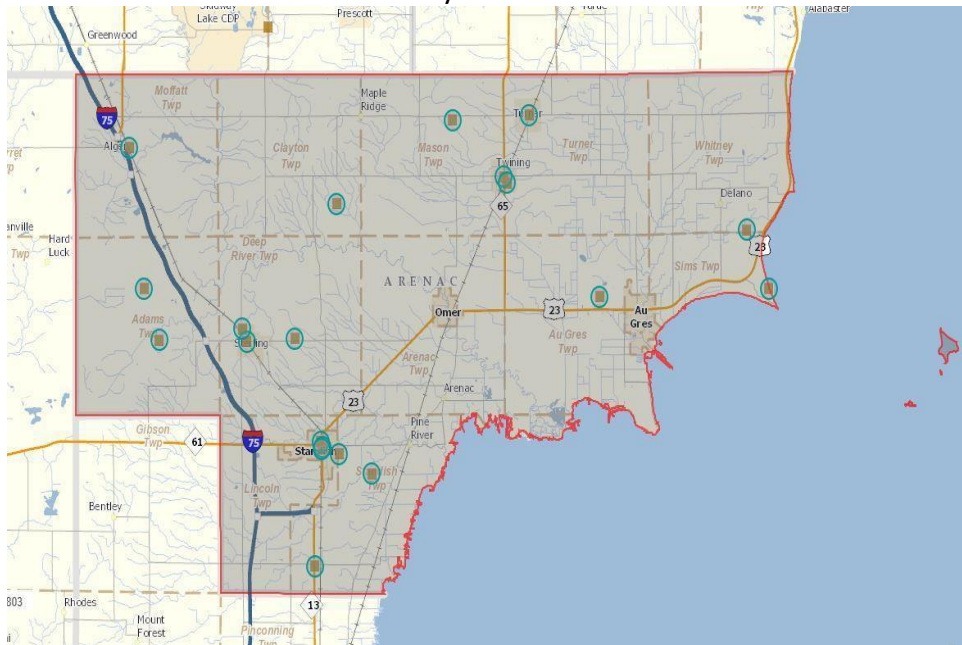


Figure 34: Part 201 Sites Map

## Environmental Contamination Sites

Site ID	Site Name	Address	City	Zip Code	Source	Pollutants
6000002	Au Gres Twp Dump Closed	Noggle Rd.	Au Gres	48743	Null	Domestic comm
6000003	Mason Turner Twps Dump	618 W. Maple Ridge Rd.	Twining	48766	Refuse Systems	Domestic waste; Dump
6000004	Res Wells Sterling Vlg	M-76	Sterling	48659	Null	Nitrate
6000005	Sims Whitney Twp Disposal	Van Horn & Bessinger Rds.	Au Gres	48703	Refuse Systems	Domestic comm
6000006	Skidway Former Disposal	3164 Knight Rd.	Omer	48749	Refuse Systems	Ammonia
6000008	North Adams Oil Field	Sterling & Adams Rd.	Sterling	48659	Oil & Gas Extraction	Cl; Na; Calcium sulfates
6000009	Standish Oil Bulk	201 Front St.	Standish	48658	Petroleum & Coal Products	Benzene; Ethylbenzene; Toluene; Xylenes
6000011	Crescent Driver Former Boathouse	Crescent Drive, 4 separate parcels	Au Gres	48703	Misc Repair Services	Benzene; Ethylbenzene; Toluene; Xylenes
6000048	O'Brien's V+S Variety	121 South Main 119 S. Main	Standish	48658	Gasoline Service Station	Naphthalene
6000051	Rayburn Oil Company	Melita Road	Sterling	48659	Null	Null
6000052	East City Limits Rd. Dump	3655 East City Limits Rd	Standish	48658	Null	Pb
6000057	Arnold's Hardware (former)	309-311 South State Street	Twining	48766	Hardware Store	Benzo(a)pyre ne; Metals
6000060	Bennett's Auto Service (former) drums	1486/1506 M-76	Alger	48610	Null	null

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6000061	Forshee Funeral Home (Former)	112 Lee Street	Twining	48766	Misc Services	1, 2, 4 TMB
Site ID	Site Name	Address	City	Zip Code	Source	Pollutants
6000062	Main St. 200 Block S., Standish	200 Block S. Main st.	Standish	48658	Null	Xylenes
6000065	Deep River Township dump	Sterling Rd. ¼ mile E of Deep River Rd	Sterling	48749	Refuse Systems	Landfill
6000074	Saganing Sagamok	5537 S. Huron Rd	Pinconning	48650	Null	Null
6000080	Enbridge PL (MP1602.02 ) 2/15/12 release	Sterling Truck Trail	Sterling	48765	Null	Null
6000084	Main and A Street, Turner	Main Street	Turner		null	null

**Table 2** - Source: MD00014894EQ

The regulatory authority for underground storage tanks is under Part 211, Underground Storage Tank Regulations, of Act 451 of 1994, as amended, and the Michigan Underground Storage Tank Rules (MUSTR). In addition to MUSTR, new tanks and piping shall comply with the Storage and Handling of Flammable and Combustible Liquids Rules. Owners/operators of petroleum underground storage tanks (USTs) are required to provide for taking corrective action and for compensating third parties for bodily injury and property damage arising from a release by petroleum USTs. Suspected and confirmed releases from regulated USTs must be reported currently to the Storage Tank Division. There are 93 Active Underground Storage Tanks in Arenac County.

### Active Underground Storage Tanks

Facility ID	Facility Name	Address	City	Zip Code
00013497	Northport Liquor Inc	3660 E Huron Rd	Au Gres	48703
00041344	Standish Co (M26735)	330 North Main Street	Standish	75202
00036881	Au Gres Yacht Club Marine Store	3135 Midshipman Dr	Au Gres	48703
00037259	Kelly's	515 N Huron US-23 & Hammel Beach	Au Gres	48703

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00020307	Dore Store #19	19 E Huron Rd	Omer	48749-9709
00017929	Dore Store #4	5353 M-61	Standish	48631
Facility ID	Facility Name	Address	City	Zip Code
00014894	Dore Store #6	2003 M-33	Alger	48610-9746
00011586	Forward #1 Plaza	201 S Main	Standish	48658
00010716	Forward Alger Plaza	1990 Brock Rd	Alger	48610-9475
00038790	Forwards Sterling	600 Saginaw St	Sterling	48659-9706
00040006	Narski's	2320 N Brock Rd M-33	Alger	48610
00015610	Mary's Kountry Korner LLC	2005 N Melita Rd	Sterling	48659-9771
00000910	Pine River Grocery	2068 Pine River Rd	Standish	48658
00033785	MDOC - Standish Correctional Facility	4713 M-61	Standish	48658-9422
00035295	Northport Station LLC	3714 E Michigan Ave	Au Gres	48703
00016783	Pier 23	2490 E Huron Rd	Au Gres	48703-9306
00005707	Next Door Store #1073	5354 M-61 Hwy West	Standish	48658-9424
00012218	BP	421 N Main St	Standish	48439
00038404	Saganing Sagamok	5537 S Huron Rd	Pinconning	48650-6414
00009418	Rich Oil #8858	320 S MAIN ST	STANDISH	45501
00035221	Standish-Sterling Community School District Transportation Facility	3955 Wyatt Rd	Standish	48658-9120

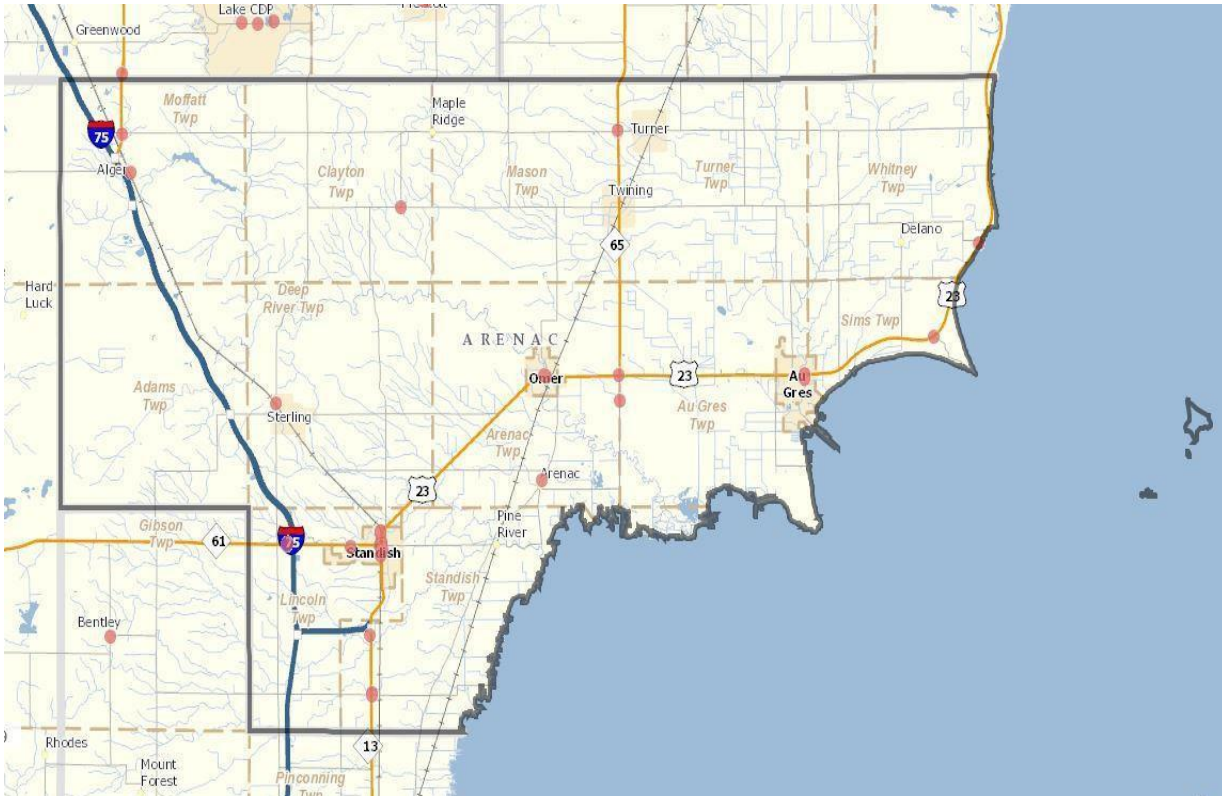
Table 3 - Source: M11586DEQ

At the time of a release, the owner/operator is responsible for the corrective actions mandated by Part



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213, Leaking Underground Storage Tanks, of the Natural Resources and Environmental Protection Act, 1994 of PA 451, as amended. Owners/operators are required to hire consultants that meet the qualifications in Section 21325 of Part 213 to perform corrective actions and to submit specific reports required by the statute. The Remediation Division is charged with selectively auditing the final assessment reports and closure reports. There are 49 open Leaking Underground Storage Tanks in Arenac County.



**Figure 35: Arenac County Leaking Underground Storage Tanks Map**

### Storage Tanks

Facility ID	Facility Name	Address	City	Zip Code
00000053	Arenac County Rd Commission	16 BRIDGE ST 116 BRIDGE (FORMERLY)	OMER	48749
00000053	Arenac County Rd Commission	16 BRIDGE ST 116 BRIDGE (FORMERLY)	OMER	48749
00000052	Arenac County Road Commission	4295 WEST M-61	STANDISH	48749
00000052	Arenac County Road Commission	4295 WEST M-61	STANDISH	48749

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00000052	Arenac County Road Commission	4295 WEST M-61	STANDISH	48749
50005345	Bennett's Auto Service	1486 Old M-76	Alger	48610
00042576	Former Pressler Electric	304 E Huron	Au Gres	48641
00016087	Edward G Dobbrowski (Bunks Party Store)	US-23 & M-65 (14 W HURON RD)	OMER	48749
00041802	Abandoned Corner	3493 Main Street Rd	Sterling	48659-

Facility ID	Facility Name	Address	City	Zip Code
	Store - Main Road 3493		Clayton Twp	9415
00017929	Dore Store #4	5353 M-61	Standish	48631
00033768	Lar-mart	105 N MAIN	STANDISH	48707
00033768	Lar-mart	105 N MAIN	STANDISH	48707
00033768	Lar-mart	105 N MAIN	STANDISH	48707
00018273	Beacon & Bridge Market #23	128 S Main St	Standish	48658
00018273	Beacon & Bridge Market #23	128 S Main St	Standish	48658
00018273	Beacon & Bridge Market #23	128 S Main St	Standish	48658
00011586	Forward #1 Plaza	201 S Main	Standish	48658
00011586	Forward #1 Plaza	201 S Main	Standish	48658
00011586	Forward #1 Plaza	201 S Main	Standish	48658
00011586	Forward #1 Plaza	201 S Main	Standish	48658
00010716	Forward Alger Plaza	1990 Brock Rd	Alger	48610-9475
00010716	Forward Alger Plaza	1990 Brock Rd	Alger	48610-9475
00038790	Forwards Sterling	600 Saginaw St	Sterling	48659-9706
00007233	Gas & Go #6	4708 S Huron Rd	Standish	48658-9472
00042161	Former Gas Station	5020 E Huron Rd	Au Gres	48730
00013566	4 Seasons Sport Center	429 W HURON	AU GRES	48703

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00021864	Cedar Valley Service	2019 N M 65	Twining	48766-9788
00002426	Central Oil/Wild Bills Wrecker	100 N MAIN ST	STANDISH	48909
00020284	Au Gres State Docks	201 S Water St	Au Gres	48909
00020284	Au Gres State Docks	201 S Water St	Au Gres	48909
50005971	Arenac County Land Bank Property	SW Corner of W Main & A Street	Turner	99999
50005990	Arenac County Land Bank Property	NE Corner of N State St & Main St	Twining	99999
50005413	Bud's Transit Mix Concrete	1275 S Hale Rd	Omer	99999
50001087	Williams Department	102 S MAIN	STANDISH	99999

Facility ID	Facility Name	Address	City	Zip Code
	Store			
00035509	River's Edge of Au Gres Inc (Lessee)	415 E Huron Rd	Au Gres	99999
00041048	Rob's Auto	116 CENTER	Omer	48766
00005707	Next Door Store #1073	5354 M-61 Hwy West	Standish	48658-9424
00005707	Next Door Store #1073	5354 M-61 Hwy West	Standish	48658-9424
00005316	Arenac Store	2670 Arenac State Rd	Standish	48658-9718
00019472	Ancel Groceries	5483 S Huron	Pinconning	48650
00019472	Ancel Groceries	5483 S Huron	Pinconning	48650
00012218	BP	421 N Main St	Standish	48439
00038404	Saganing Sagamok	5537 S Huron Rd	Pinconning	48650-6414
00005539	Spartan Tire	307 N Main St	Standish	48658-9233
00009418	Rich Oil #8858	320 S MAIN ST	STANDISH	45501
00004441	Super Mart #43	203 N Main St	Standish	48917
00004441	Super Mart #43	203 N Main St	Standish	48917
00004441	Super Mart #43	203 N Main St	Standish	48917

00002968	Wiltse Chev-olds Buick	501 NORTH M-76	STANDISH	48658
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Table 4 - Source: MDEQ

Superfund Amendments & Restoration Act Title III establishes requirements for federal, state, and local governments, Indian tribes, and industry regarding emergency planning and “Community Right- to-Know” reporting on hazardous and toxic chemicals. The Community Right-to-Know provisions help to increase the public’s knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment.

The Superfund Amendments & Restoration Act Title III is a federal act that is enforced in Michigan by the U.S. Environmental Protection Agency. The requirements are implemented in Michigan under an executive order from the Governor. Executive Order 2007-18 created the Michigan Citizen- Community Emergency Response Coordinating Council as an advisory body within the Michigan Department of State Police. This new council is responsible for developing and implementing citizen volunteer emergency response plans and hazard mitigation plans, and it acts as the “state emergency response commission” as required by federal statute.

The objectives of the Resource Conservation and Recovery Act (RCRA) are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner. RCRA regulates the management of solid waste, hazardous waste, and underground storage tanks holding petroleum products or other specific chemicals. Hazardous waste information is contained in a national program management and inventory system of hazardous waste handlers. In general, all generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities to state environmental agencies. These agencies in turn pass on the information to regional and national EPA offices. These regulations are governed by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984.

Below is a table of Registered Facilities in Arenac County under the RCRA program:

Facility Name	Street Address	City Name	State	ZIP Code
AGUIRRE NICK	2607 WHITES BEACH RD	STANDISH	MI	48658
APC STORES INC	410 N MAIN ST	STANDISH	MI	48658
ARENAC CASTING INC	4397 AIRPARK DR	STANDISH	MI	48658
ARENAC COUNTY ROAD COMMISSION	ARENAC STATE RD OVER PINE RIVER	OMER	MI	48749
ARENAC COUNTY ROAD COMMISSION	ARENAC STATE RD OVER	OMER	MI	48749
ATD ENGINEERING & MACHINE LLC	533 N COURT ST	AU GRES	MI	48703
BENNETT GLASS	1506 N M 76	ALGER	MI	48610
BERTHIAUMES BODY SHOP	3655 E CITY LIMITS RD	STANDISH	MI	48658

## Arenac County Hazard Mitigation Plan 2021

BOPP BUSH MFG CO	205 N MACKINAW ST	AU GRES	MI	48703
COBRA OIL & GAS CORPORATION	MAPLE RIDGE RD	STERLING	MI	48659
COBRA OIL & GAS CORPORATION	TWINING ROAD	TWINING	MI	48766
COBRA OIL & GAS CORPORATION	DECKER ROAD	STERLING	MI	48659
COBRA OIL & GAS CORPORATION	44.15430/-83.98086	STERLING	MI	48659
CONSUMERS ENERGY	M 55	TWINING	MI	48766
CONSUMERS ENERGY CO	4271 AIRPARK DR	STANDISH	MI	48658
COUNTY OF ARENAC SHERIFF DEPARTMENT	126 N GROVE ST	STANDISH	MI	48658
DEPARTMENT OF PUBLIC WORKS	909 E CEDAR ST	STANDISH	MI	48658
FAMILY DOLLAR STORES	529 S MAIN ST	STANDISH	MI	48658
FOSTER OIL CO	317 N MAIN ST	STANDISH	MI	48658
GENERAL PARTS DISTRIBUTION LLC	311 S MAIN ST	STANDISH	MI	48658
GLOBE FIRE SPRINKLER CORP	4077 AIRPARK DR	STANDISH	MI	48658
GLOBE TECHNOLOGIES CRP	1109 W CEDAR ST	STANDISH	MI	48658

Facility Name	Street Address	City Name	State	ZIP Code
GMR EQUIPMENT & DESIGN LLC	4767 S HURON RD	STANDISH	MI	48658
INTERNATIONAL TRANSMISSION COMPANY LLC	180 W MAIN ST	TWINING	MI	48766
KIME COLLISION CORP	4020 S HURON RD	STANDISH	MI	48658
M & M INDUSTRIES INC	4215 AIRPARK DR	STANDISH	MI	48658
MAGLINE INC	1205 W CEDAR ST	STANDISH	MI	48658
MCLAREN MEDICAL GROUP	5170 RIFLE RIVER TRAIL	ALGER	MI	48610
MCTAGGARTS	219 N FRONT ST	STANDISH	MI	48658
MI DEPT/CORRECTIONS	4713 M 61	STANDISH	MI	48658
MI DEPT/TRANSPORTATION	M 33 OVER I 75	ALGER	MI	48610
MI DEPT/TRANSPORTATION	M33 CONN OVER D&M RR & OLD M76	ALGER	MI	48610
MI DEPT/TRANSPORTATION	US23 UNDER MELITA ROAD	LINCOLN TOWNSHIP	MI	48658
MI DEPT/TRANSPORTATION BRIDGE (B02-06073)	US-23 OVER AU GRES RIVER	AU GRES	MI	48703
MI DEPT/TRANSPORTATION BRIDGE (B03-06072)	US-23 OVER RIFLE RIVER	OMER	MI	48749
MI DEPT/TRANSPORTATION BRIDGE S13 031111	I75 UNDER US23 RAMP F I75	STANDISH	MI	48658
MISTEQUAY GROUP LTD	1015 W CEDAR ST	STANDISH	MI	48658

NORTHEASTERN MFG AND SALES INC	4141 AIRPARK DR	STANDISH	MI	48658
PIONEER PRECISION INC	2451 AUGUSTINE RD	STANDISH	MI	48658
QUICK SAV FOOD STORES LTD	128 S MAIN ST	STANDISH	MI	48658
RICHARDSON FORD	3781 S HURON RD	STANDISH	MI	48658
RITE AID #2549	301 S MAIN ST	STANDISH	MI	486582512
SPEEDWAY LLC	320 S MAIN ST	STANDISH	MI	48658
STANDISH DRY CLEANERS	205 W CEDAR	STANDISH	MI	48658
STANDISH LAUNDRY & DRYCLEANERS	220 E CEDAR ST	STANDISH	MI	48658
T & K MACHINE INC	1486 N M 76	ALGER	MI	48610

Table 5 - United States Environmental Protection Agency (EPA)

### Public Water Supply & Wellhead Protection

Michigan’s groundwater is used for drinking water by nearly half of the state’s population. In addition, it is used for irrigation and industrial purposes and contributes to the economy and our quality of life in Michigan, the Great Lakes State. To safeguard public water supply systems from contamination, the federal Safe Drinking Water Act, 1976 PA 399, was amended in 1986 to include wellhead protection. Through these amendments, Michigan implemented a voluntary, statewide Wellhead Protection Program (WHPP). Michigan’s WHPP is composed of a set of guidelines that help communities protect their drinking water by identifying the area that contributes groundwater to public water wells, identifying sources of contamination within that area, and developing methods to manage the area cooperatively and to minimize the threat to the public water systems. The Communities in Arenac County that have public water systems are:

#### Public Water Systems

WSSN	Name	Population	Source
00280	City of Au Gres	889	SW
00285	Au Gres Township	66	SWP
05005	City of Omer	313	SW
05880	Saginaw Midland Water Supply	1	SW
06073	Sims-Whitney Utilities Auth	5627	SW
06350	City of Standish	1509	SW
62841	Medilodge of Sterling	84	GW

Table 6

Communities with a WHPP receive a higher level of environmental review in the state permitting process. In addition, permitting for underground and above ground storage tanks, spillage of polluting materials, and discharging to groundwater include more stringent requirements within Wellhead

Protection Areas. Consequently, communities that have designated Wellhead Protection Areas (WHPA) are better able to safeguard their groundwater from contamination. Financial assistance is also available for the development of management practices (e.g., planning and zoning) and the search for and plugging of abandoned wells within the WHPA.

As part of the local WHPP, it is important that the municipalities with a public water supply identify an effective contingency plan for emergencies that may threaten wells serving the water system. The plan should identify personnel, testing equipment, materials, and procedures necessary for the fast and effective mitigation of emergencies. A contingency plan should include a public water supply system emergency response protocol, notification procedures, and methods for handling emergencies based upon the nature of the emergency and the threat to the water system. Contingency plans should provide a course of action with an emphasis on providing a mechanism for containment in the case of chemical spills. The contingency plan should also identify alternative water supplies if an emergency results in an impact to a well or wells serving the public water system.

## **Population and Economic Characteristics**

### **Social Features**

This section of the Plan describes the population of Arenac County and Michigan. The description focuses on the County and its unique population characteristics. In addition to the overall population figures, this section also describes the population’s age, gender, and race. Household distribution is also detailed as well as the number of people with physical disabilities. Employment trends are discussed along with employment distribution, income, and poverty status.

### **Population Trends and Projections**

Arenac County’s population decreased by 6.4 percent from 2010 to 2020 going from 15,899 to 15,002. Over this ten-year period, the state increased 1.0% while the United States population increased 6.3%.

Arenac County residents, like most of the region, are almost all white (96.0%) and are almost equally divided between the sexes, (7,382 females, 7,501 male). More than half of residents are homeowners (83.8%) where the average household size is 2.26 persons. The median age in the county is 46.7 years, with 20.3% of the population aged over 65 years of age.

The average commuting time for county residents is 24.2 minutes as compared to 25.9 minutes for the average commuter time for all U.S. residents. Many residents travel to local cities such as Bay City, Saginaw, and Midland for work and shopping.

<b>Arenac County Population Change</b>				
	<b>2010</b>	<b>2020</b>	<b>Change</b>	<b>% Change 2010-20</b>
<b>ARENAC COUNTY</b>	15,899	15,002	-887	-6.4%
<b>Townships</b>				

Adams	550	563	13	2.4%
Arenac	992	903	-89	-9.0%
Au Gres	1,007	953	-54	-5.4%
Clayton	1,101	1,097	-4	-0.4%
Deep River	2,244	2,149	-95	-4.2%
Lincoln	1,522	942	-580	-38.1%
Mason	994	851	-143	-14.4%
Moffatt	1,121	1,184	63	5.6%
Sims	1,091	1,095	4	0.4%
Standish	2,026	1,900	-126	-6.2%
Turner	642	358	-16	-2.0%
Whitney	1,033	1,001	-32	-3.1%
<b>Villages</b>				
Sterling	533	530	-3	-0.6%
Turner	139	114	-25	-18%
Twining	192	181	-11	-5.7%
<b>Cities</b>				
Au Gres	1,028	889	-139	-13.5%
Omer	337	313	-24	-7.1%
Standish	1,581	1,509	-72	-4.6%

Table 7 - Source: U.S. Census Bureau, 2019 Census

Arenac County Population Projections		
	2019	2040
<b>ARENAC COUNTY</b>	15,859	16,494
<b>Townships</b>		
Adams	559	577
Arenac	896	922
Au Gres	949	984
Clayton	1,091	1,129
Deep River	1,622	1,701
Lincoln	936	966
Mason	744	770
Moffatt	1,184	1,237
Sims	1,092	1,134
Standish	1,894	1,967
Turner	356	368
Whitney	1,013	1,081
<b>Villages</b>		
Sterling	531	557
Turner	113	117
Twining	180	186
<b>Cities</b>		



Au Gres	885	917
Omer	310	320
Standish	1,503	1,559

Table 8 - Source: U.S. Census Bureau, 2015 American Community Survey

### Age Distribution

While the overall population is the most important consideration, there are other characteristics to consider when addressing potential hazards. The age distribution of a County can influence the types of facilities and programs needed. Table 9 shows that the County’s median age (46.7) is higher than Michigan’s median age of 38.9 with a larger percentage of individuals in every age bracket after 45 years of age.

Arenac County Age Distribution		
Age Group	Population	Percentage
Under 5 years	682	4.5%
5 to 9 years	743	4.9%
10 to 14 years	770	5.1%
15 to 19 years	810	5.4%
20 to 24 years	675	4.5%
25 to 34 years	1,480	9.8%
35 to 44 years	1,513	10.0%
45 to 54 years	1,927	12.8%
55 to 59 years	1,302	8.6%
60 to 64 years	1,506	10.0%
65 to 74 years	2,194	14.6%
75 to 84 years	1,154	7.7%
85 years and over	314	4.5%
<i>Median age (years) 50.0</i>		

Michigan Age Distribution		
Age Group	Population	Percentage
Under 5 years	591065	5.7%
5 to 9 years	623334	5.9%
10 to 14 years	661499	6.3%
15 to 19 years	704793	6.6%
20 to 24 years	1267775	7.1%
25 to 34 years	1165370	12.7%
35 to 44 years	1317258	11.7%
45 to 54 years	718008	13.2%
55 to 59 years	678726	7.2%

60 to 64 years	975417	6.8%
65 to 74 years	483853	9.8%
75 to 84 years	207073	4.9%
85 years and over	591065	2.1%
<i>Median age (years) 39.7</i>		

**Table 9** - Source: U.S. Census Bureau, 2019 Census

**Gender Distribution**

Most communities have a slightly higher proportion of females since they have a longer life expectancy. In Michigan, females account for 50.9 percent of the population while in Arenac County females account for 49 percent of the population.

Arenac County Gender Distribution		
	Population	Percentage
Male	6239	50.5%
Female	6110	49.5%

Michigan Gender Distribution		
	Population	Percentage
Male	3790650	48.7%
Female	3996737	51.3%

**Table 10** - Source: U.S. Census Bureau, 2019 Census

**Racial Composition**

The racial composition of Arenac County is different from Michigan’s but similar to most northern Michigan communities. Table 11 shows the County’s population distribution is 96.8 percent White, 0.5 percent Black or African American, 1.5 percent American Indian and Alaska Native, 0.4 percent Asian, 0.4 Native Hawaiian and other Pacific Islander and 0.4 percent some other race. Arenac County has a higher percentage of Whites, a lower percentage of Black or African American, a lower percentage of Asians, Native Hawaiian and other Pacific Islander and a lower percentage of other races than the State of Michigan.

Arenac County Racial Distribution		
	Population	Percentage
White	14,500	96.2%
Black or African American	62	0.4%
American Indian and Alaska Native	198	1.3%
Asian	55	0.4%

Native Hawaiian and other Pacific Islander	0	0.0%
Some other race	20	0.1%

### Michigan Racial Distribution

	Population	Percentage
White	7,813,755	78.4%
Black or African American	1,374,314	13.8%
American Indian and Alaska Native	53,316	0.5%
Asian	31,1721	3.1%
Native Hawaiian and Other Pacific Islander	3,099	0.0%
Some other race	117,801	1.2%

**Table 11** - Source: U.S. Census Bureau, 2019 Census

### Household Composition

Household composition can influence a community’s needs since the distribution often identifies unique community traits. Arenac County has several household characteristics that may influence hazard mitigation planning. Table 12 shows the County has a 0.4% higher proportion of family households (67.8 percent) than the State of Michigan (66.0 percent). Arenac County has a higher percentage of married couple families than the state and a lower proportion of female householders with no spouse in comparison to Michigan as a whole. The State of Michigan does have a slightly higher average household size than Arenac County.

### Arenac County Household Distribution

HOUSEHOLDS BY TYPE	Total	%
Total household	6,571	100%
Family households	3,276	49.9%
Non-family households	2,781	42.3%
Husband-wife family	3,559	53.1%
Male householder, no wife present	1,310	19.9%
Female householder, no husband present	1471	22.4%
Nonfamily households	2,781	32.2%
Households with individuals under 18 years	1,414	21.5%
Households with individuals 65 years and over	2,556	38.9%
<i>Average household size 2.26</i>		
<i>Average family size 2.79</i>		

Source: U.S. Census, 2019 Census

Michigan Household Distribution		
HOUSEHOLDS BY TYPE	Total	%
Total households	3,935,041	100.0%
Family households	1,853,456	47.1%
Non-family households	1,822,575	46.3%
Husband-wife family	1,853,456	47.1%
Male householder, no wife present	730733	18.6%
Female householder, no husband present	1,091,842	27.7%
Nonfamily households	1,822,575	46.3%
Households with individuals under 18 years	1,127,499	28.7%
Households with individuals 65 years and over	1,181,569	30.0%
<i>Average household size 2.47</i>		
<i>Average family size 3.07</i>		

**Table 12** - Source: U.S. Census, 2019 Census

**Physical Disabilities**

Table 13 shows noninstitutionalized residents with any disabilities. The tables indicate the County has a much higher percentage of residents with physical disabilities than the State of Michigan. This population can require additional assistance in the event of certain emergencies such as power outages or severe weather.

Arenac County Physical Disabilities		
	Number	%
With any disability	3,008	20.1%

Michigan Physical Disabilities		
	Number	%
With any disability	1,401,370	14.2%

**Table 13** - Source: U.S. Census, 2019 Census

**Employment**

From 2000 to 2003 Arenac County and the State of Michigan jobless rates increased and then leveled off from 2003 to 2008. In 2009 the Arenac County and the State of Michigan jobless rates increased until 2010 and then began declining. The Michigan Department of Technology, Management, and Budget reports in 2016 the State of Michigan jobless rate at 4.7% and Arenac County jobless rate at 6.6%

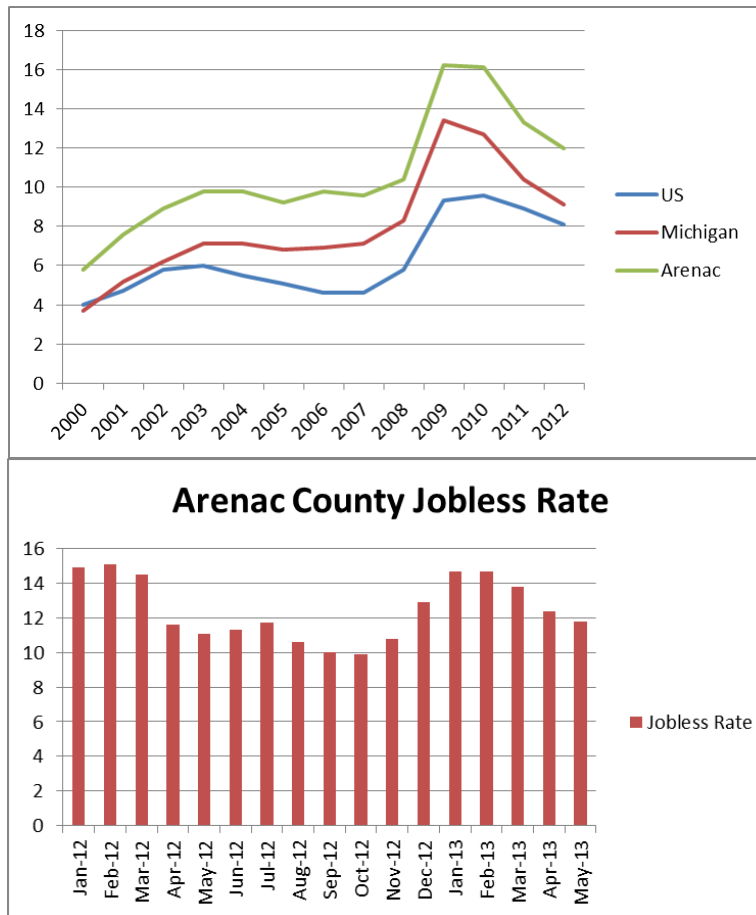


Figure 26 - 2015-16

**Arenac County Economic Statistics**

**Income:**

Median household income - \$38,307 U.S. Census Bureau, 2015 American Community Survey

Per capita income- \$21,197 U.S. Census Bureau, 2015 American Community Survey

**Employment:**

Total labor force – 6,326  
 Employed – 5,569  
 Unemployed – 757  
 Percent Unemployed – 12% in 2015

**Major Manufacturing Employers:**

ATD Engineering & Machine  
 Auburn Bean and Grain Company – The Andersons, Inc.  
 Bessinger Pickle Co., Inc.  
 Bopp-Busch Manufacturing Co.  
 Crew Products Co.,  
 Globe Sprinkler Corp.  
 Magliner  
 Maple Ridge Hardwoods  
 Vantage Plastics

For Arenac County and the State of Michigan the highest percentage of employment by industry is Educational, Health, and Social Services, Arenac County at 24.7% and Michigan at 23.9%. Manufacturing is the second highest followed by retail trade in both Arenac County and the State of Michigan.

<b>Arenac County Employment by Industry</b>		
<b>Industry</b>	<b>2010 % Employed</b>	<b>2019 % Employed</b>
Agriculture, forestry, fishing and hunting, and mining	3.6%	3.4%
Construction	5.9%	7.1%
Manufacturing	15.7%	17.2%
Wholesale trade	1.9%	2.5%
Retail trade	14.6%	13.4%
Transportation, warehousing, and utilities	5.5%	5.9%
Information	9%	0.7%
Finance, insurance, real estate, and rental and leasing	3.9%	3.0%
Professional, scientific, management, administrative, and waste management services	5.2%	5.7%
Educational, health, and social services	24.7%	21.9%
Arts, entertainment, recreation, and accommodations, and food services	10.5%	9.8%
Other services (except public administration)	3.6%	5.5%
Public administration	4%	4.0%

**Table 14** - Source: U.S. Census, 2010 and 2019 Census

State of Michigan Employment by Industry		
Industry	2010 % Employed	2019 % Employed
Agriculture, forestry, fishing and hunting, and mining	1.3%	1.2%
Construction	4.8%	5.4%
Manufacturing	17.8%	18.6%
Wholesale trade	2.4%	2.4%
Retail trade	11.4%	10.8%
Transportation, warehousing, and utilities	4.2%	4.4%
Information	1.6%	1.4%
Finance, insurance, real estate, and rental and leasing	5.4%	5.4%
Professional, scientific, management, administrative, and waste management services	9.3%	9.5%
Educational, health, and social services	23.9%	23.4%
Arts, entertainment, recreation, accommodations, and food services	9.5%	9.6%
Other services (except public administration)	4.7%	4.6%
Public administration	3.6%	3.4%

Table 15 - Source: U.S. Census, 2010 and 2019 Census

### Income Levels

Arenac County’s household income levels are lower than the State of Michigan’s. Table 16 shows that Arenac County’s median household income was estimated at \$42,290 in 2019. This figure is lower than Michigan’s estimated median household income of \$57,144. The County also has a lower per capita income than the State of Michigan. The estimated percentage of families below poverty level in Arenac County was 11.6% in 2019, higher than the State of Michigan’s estimated rate of 9.9%.

Arenac County Income Levels	
Median household income (dollars)	\$42,290
Per capita income (dollars)	\$24,328
Percent below poverty level (Families)	11.6%

Michigan Income Levels	
Median household income (dollars)	\$57,144
Per capita income (dollars)	\$31, 713
Percent below poverty level (Families)	9.9%

Table 16 - Source: 2019 American Community Survey

**Housing**

Housing in Arenac County is an important consideration in hazard mitigation since it is where the population lives and makes up a large part of a community’s wealth. The age, location, and quality of housing can influence the amount of damage a community sustains in many types of hazardous events.

**Housing Tenure**

In 2010, Arenac County had 9,803 housing units. Of the total figure, 6,701 were occupied (68.4 percent), which is a far lower percentage than Michigan as-a-whole (85.4 percent). Arenac County has a higher percentage of owner-occupied housing units, 83.6 percent as compared to the 72.1 percent State average.

Arenac County has many seasonal homes that are occupied at various times during the year. The large number of vacant and seasonal houses can cause problems if broken pipes, gas leaks, or other damage go unchecked or un-repaired.

<b>Arenac County Housing Units</b>		
<b>Total housing units</b>	<b>9,836</b>	<b>100%</b>
Occupied housing units	6,571	66.8%
Vacant/Seasonal housing units	3,265	33.2%
<b>Total occupied housing units</b>	<b>6,571</b>	<b>100%</b>
Owner-occupied housing units	5,506	83.8%
Renter-occupied housing units	1,065	16.2%

<b>Michigan Housing Units</b>		
<b>Total housing units</b>	<b>4,596,198</b>	<b>100.0%</b>
Occupied housing units	3,935,041	85.6%
Vacant/Seasonal housing units	661,157	14.4%
<b>Total occupied housing units</b>	<b>3,935,041</b>	<b>100.0%</b>
Owner-occupied housing units	2,802,699	71.2%
Renter-occupied housing units	1,132,342	28.8%

**Table 17** - Source: U.S. Census Bureau, 2019 Census

**Seasonal Population Trends**

In the spring, summer, and fall months, Arenac County experiences significant population increases due to seasonal residences, summer youth camps, camping, and numerous recreational activities. The following is an estimated population during the peak months. The population estimate for seasonal homes is based on the number of seasonal homes in Arenac County times the average household size reported in the 2010 US Census. The data for the number of campsites in Arenac County is from the District Public Health Department Environmental Office. The data for the Youth Camps, Hotels, and Bed and Breakfasts are based on an average total capacity for the area.



<b>Arenac County Seasonal Housing</b>		
	<b>2000</b>	<b>2010</b>
	<b>Seasonal</b>	<b>Seasonal</b>
<b>ARENAC COUNTY</b>	2274	2398
<b>Townships</b>		
Adams	22	18
Arenac	79	76
Au Gres	176	226
Clayton	68	77
Deep River	137	129
Lincoln	13	14
Mason	57	64
Moffatt	354	387
Sims	580	592
Standish	165	169
Turner	44	47
Whitney	432	463
<b>Villages</b>		
Sterling	3	6
Turner	8	4
Twining	2	2
<b>Cities</b>		
Au Gres	132	116
Omer	7	12
Standish	8	8

Table 18 - Source: U.S. Census Bureau, 2010 Census

<b>Seasonal Population Trends</b>	
Arenac County Population (2010)	15,899
Seasonal Homes (2,274 x 2.49 Persons per household)	5,662
Campsites (2,500 sites x 4 Persons per campsite)	10,000
Youth Camps 8 Camps	1,696
Hotels and Beds and Breakfasts 12 Facilities	540
<b>Projected Increase in Population</b>	<b>17,898</b>

**Housing Distribution**

Arenac County has a much higher percentage of single-family homes than Michigan as a whole, 78.7% in Arenac County compared to 72.2% for Michigan. The largest difference with the State of Michigan

in housing distribution is the County’s low percentage of multiple-family housing and more than twice the percentage of mobile homes.

<b>Arenac County Housing Distribution</b>		
<b>Total housing units</b>	<b>9,836</b>	<b>100.0%</b>
<b>Units in Structure</b>		
1-unit, detached	7,743	78.7%
1-unit, attached	58	0.6%
2 units	57	0.6%
3 or 4 units	91	0.9%
5 to 9 units	234	2.4%
10 units or more	80	0.8%
Mobile home or other type of housing	108	1.1%

<b>Michigan Housing Distribution</b>		
<b>Total housing units</b>	<b>4,596,198</b>	<b>100.0%</b>
<b>Units in Structure</b>		
1-unit, detached	3,317,356	72.2%
1-unit, attached	210,458	4.6%
2 units	107,000	2.3%
3 or 4 units	119,521	2.6%
5 to 9 units	194,917	4.2%
10 units or more	163,101	3.5%
Mobile home or other type of housing	240,358	5.2%

**Table 19** - Source: U.S. Census Bureau, 2019 Census

### **Age of Housing**

Most of the housing structures in Arenac County were built before 1980. From 1960 to 1979 15.7% of homes were built and 21.7% from 1940 to 1959. Michigan had fewer homes built from 1960 to 1979 (9.9%) and more homes built from 1940 to 1959 (15.4%). Older housing stock is often more susceptible to fires due to construction materials and methods as well as potentially having electrical systems that do not meet current codes.

Arenac County Housing Age		
Year Structure Built	Total	Percentage
2014 or later	39	0.4%
2010 to 2013	101	1.0%
2000 to 2009	957	9.7%
1980 to 1999	1599	16.3%
1960 to 1979	1549	15.7%
1940 to 1959	2135	21.7%
1939 or earlier	886	9.0%

Michigan Housing Age		
Year Structure Built	Total	Percentage
2014 or later	59,439	1.3%
2010 to 2013	57,274	1.2%
2000 to 2009	451,118	9.8%
1980 to 1999	604,882	13.2%
1960 to 1979	455,280	9.9%
1940 to 1959	708,543	15.4%
1939 or earlier	545,317	11.9%

Table 20 - Source: U.S. Census Bureau, 2019 Census

#### Value of Owner-Occupied Housing

The median value of owner-occupied housing in Arenac County was \$94,400 in 2019, considerably lower than Michigan’s median value of \$154,900. Most of the County’s owner-occupied housing is valued between \$50,000 and \$99,000, while the majority of Michigan’s is between \$50,000 and \$149,000. Housing values do not factor into hazard mitigation unless inexpensive housing is causally related to inferior construction.

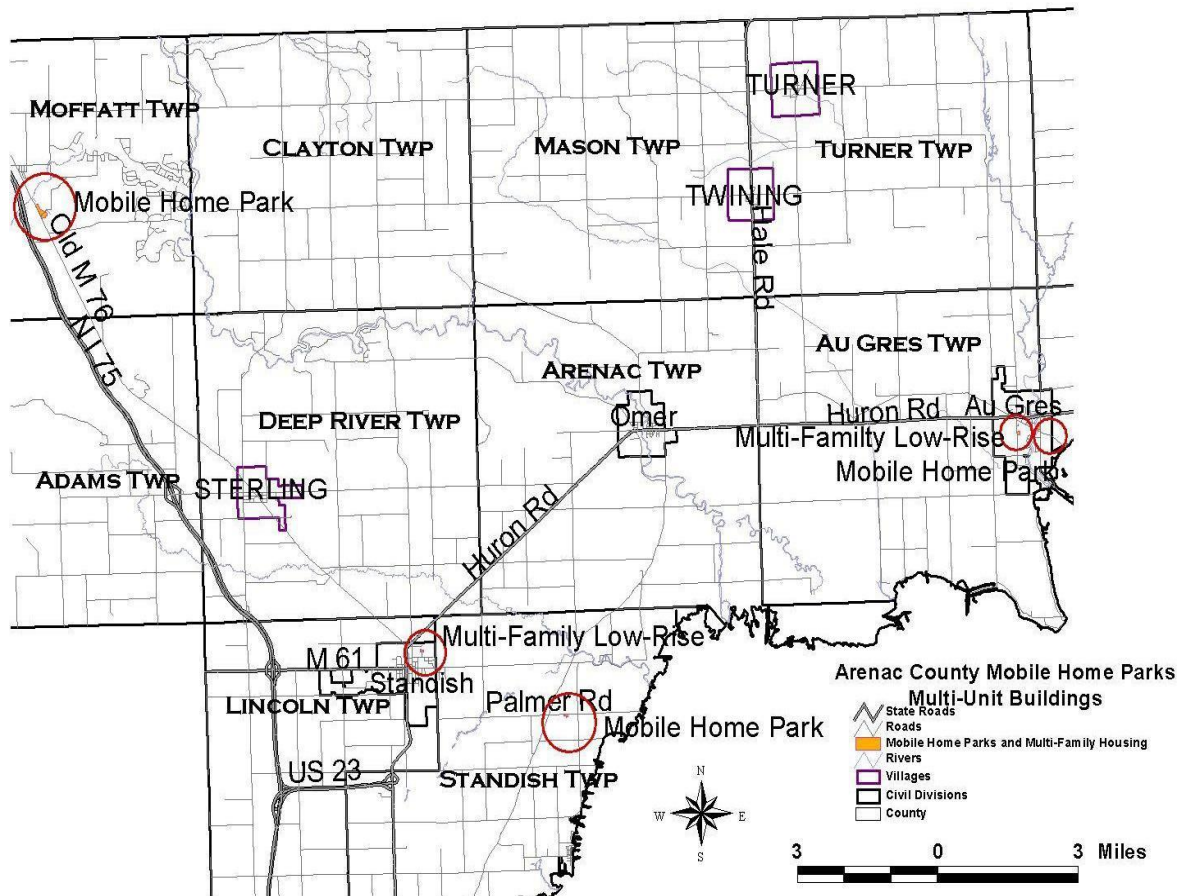
2019 Arenac County Owner-Occupied Housing Value		
Specified owner-occupied units	<b>5,506</b>	<b>100.0%</b>
VALUE		
Less than \$50,000	991	18.0%
\$50,000 to \$99,999	1,937	35.2%
\$100,000 to \$149,999	1,036	18.8%
\$150,000 to \$199,999	709	12.9%
\$200,000 to \$299,999	560	10.2%
\$300,000 to \$499,999	182	3.3%

\$500,000 to \$999,999	78	1.4%
\$1,000,000 or more	13	0.2%
<i>Median (dollars) \$94,400</i>		

### 2019 Michigan Owner-Occupied Housing Value

Specified owner-occupied units	2,802,699	100.0%
VALUE		
Less than \$50,000	326,347	11.6%
\$50,000 to \$99,999	508,868	18.2%
\$100,000 to \$149,999	510,142	18.2%
\$150,000 to \$199,999	477,897	17.1%
\$200,000 to \$299,999	514,530	18.4%
\$300,000 to \$499,999	337,418	12.0%
\$500,000 to \$999,999	105,648	3.8%
\$1,000,000 or more	21,849	0.8%
<i>Median (dollars) \$154,900</i>		

Table 21 - Source: U.S. Census Bureau, 2019 Census



**Figure 36: Arenac County Mobile Home Parks Map**

### Land Divisions and Ownership

Most of the private ownership of land in Arenac County is divided into tracts of 10 acres or larger. Small lots and subdivisions can be found within the villages, cities, and along the lakeshore.

State Forest lands can be found in Adams Township, Arenac Township, Au Gres Township, Clayton Township, Deep River Township, Moffatt Township, Mason Township, and Whitney Township. Other lands owned by the State of Michigan are scattered around the county with small areas in Arenac Township, Au Gres Township, Clayton Township, Lincoln Township, Mason Township, Sims Township, Whitney Township, Standish Township, and the City of Standish. There are State Wildlife Areas in northeastern Standish Township and southern Arenac Township.

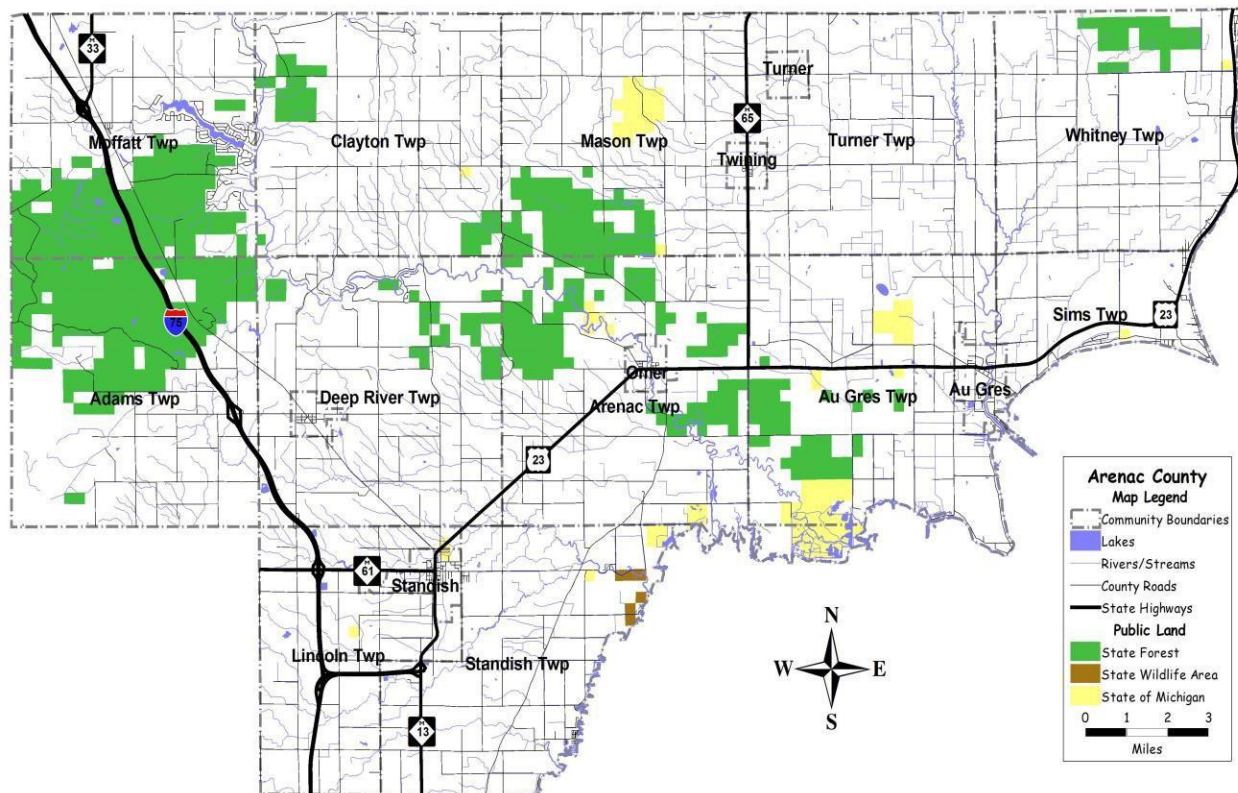


Figure 37: Arenac County Public Lands Map

### Land Cover/Use

In 1978 a countywide land cover use inventory was completed under the Michigan Resource Information System of the Michigan Department of Natural Resources. This is the only countywide land use inventory ever completed. The map of 1978 land cover use illustrates the distribution of land uses throughout the County. The following table is a listing of the land cover/use categories by acreage. Forested land was the primary land cover/use in Arenac County. This is still the case today. The top four largest categories included Forest, Agriculture, Rangeland, and Wetlands. These four categories accounted for 96 percent of the land cover/use.

Residential

As can be seen on the Existing Land Use Map and table below, residential use occupied two percent (4700 acres) of the land in the county. As would be expected, residential development is concentrated around the cities, villages, and the lakeshore. Seasonal residential development is also located adjacent to lakeshore. The trend in residential development has been construction of primary or secondary homes on lots two acres and larger along major roads.

Commercial/Industrial/Institutional

The largest concentrations of commercial uses are found in the communities of Standish, Au Gres, and the Village of Sterling. Most of the commercial land uses are service and retail in nature, catering to residents and tourists. Commercial uses can also be found in several rural locations around the county. These rural commercial uses are typically convenience retail establishments that serve the rural residents and tourists. Institutional land uses are comprised of school lands and government offices. Lands used for commercial, industrial, and institutional purposes comprised less than one-half of one percent of the county’s total area.

Land Use/Cover Table of Arenac County		
Category	Acres	Percent of Total
Residential	4,700	2%
Commercial/Industrial/Institutional	800	0.3%
Other Land Use	1,300	0.56%
Agricultural	84,300	36.1%
Rangeland	25,600	11%
Forested Land	107,300	46%
Wetlands	8,900	3.8%
Surface Water	700	0.3%
Total	233,600	100%

Table 22 - Source: Michigan Department of Natural Resources - MIRIS: 1978

Other Land Use

Land in this use category includes extractive (sand and gravel pits), cemeteries, utilities, waste disposal, and transportation (airports and roads) and accounted for about one-half percent.

Agricultural

According to the 1978 inventory, agricultural lands were found all over the county. While there has been a downward trend in acreage dedicated to agricultural uses, these lands often fall idle as opposed to being developed for urban uses as in other parts of the state and country.

Rangelands

The 25,600 acres of open rangeland are the third largest land cover in the county. This category consists of herbaceous open and shrub land. This land cover is scattered throughout the county often at the borders between agriculture and forestland. Much of the rangeland was active farmland. Given the downward trend in acreage dedicated to farming, this category has increased over the land 25 years.

Forested Land

Forested Land accounts for 107,300 or 46% of the county’s total. The most prevalent forest types are lowland hardwoods. Other forest types include red and white pine and northern hardwoods. Lowland forests grow on soils with a seasonally high-water table and are often classified as wetlands. Lowland forests include areas that support lowland hardwoods and conifers, such as northern white cedar, black spruce, balsam fir, elm, red maple, ash, and aspen species.

Wetlands

Wetlands include land that has sufficient water at, or near, the surface to support wetland or aquatic vegetation. These areas are commonly referred to as swamps, marshes, and bogs. The wetland category comprises non-forested types such as lowland brush (tag alder and willow), cattail marshes, bogs, and wet meadows. This category comprises 8,900 acres, 3.8% of the county land area. Two of the most important functions of wetlands are water quality protection and ecological corridors. The major wetland areas are adjacent to streams and lakes. The networks of wetlands receive surface water and subsurface water discharge, creating the many streams and creeks that in turn flow into the area lakes.

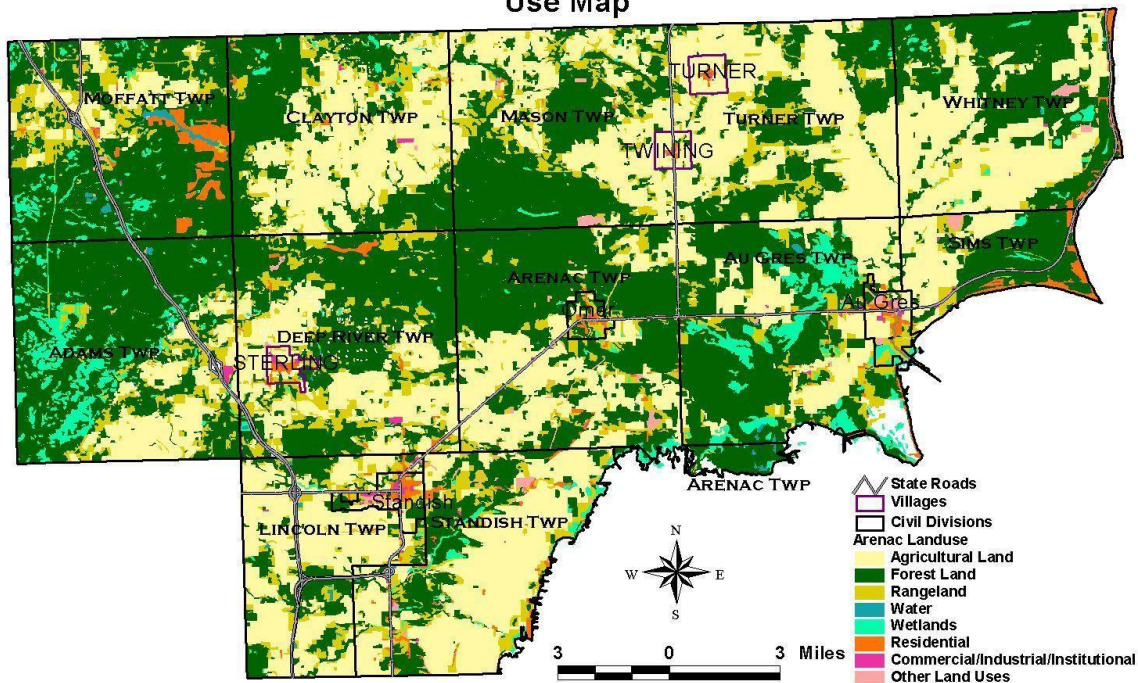
Surface Water

Lakes and impoundments are mapped as open water and account for 0.3% of the area in the county.

Planning and Zoning

Land use planning and zoning is administered at the city, village, and township levels. Arenac County has a county planning commission that advises local communities.

**Arenac County Existing  
Use Map**



**Figure 38: Arenac County Existing Land Use Map**





Chapter 3

*Community Capabilities*



## Public Facilities and Community Services

### Planning and Zoning

The counties and municipalities of Arenac County are typical of a rural northern Michigan county. There are twelve townships, three cities, and three villages. All of these are governed by the stipulated boards and councils and have participated in this plan. All municipalities within Arenac County have their own zoning ordinances and master plans except for Adams Township that has no zoning ordinance.

The county has just renewed its masterplan. Master plans are reviewed and updated, if necessary, every five years.

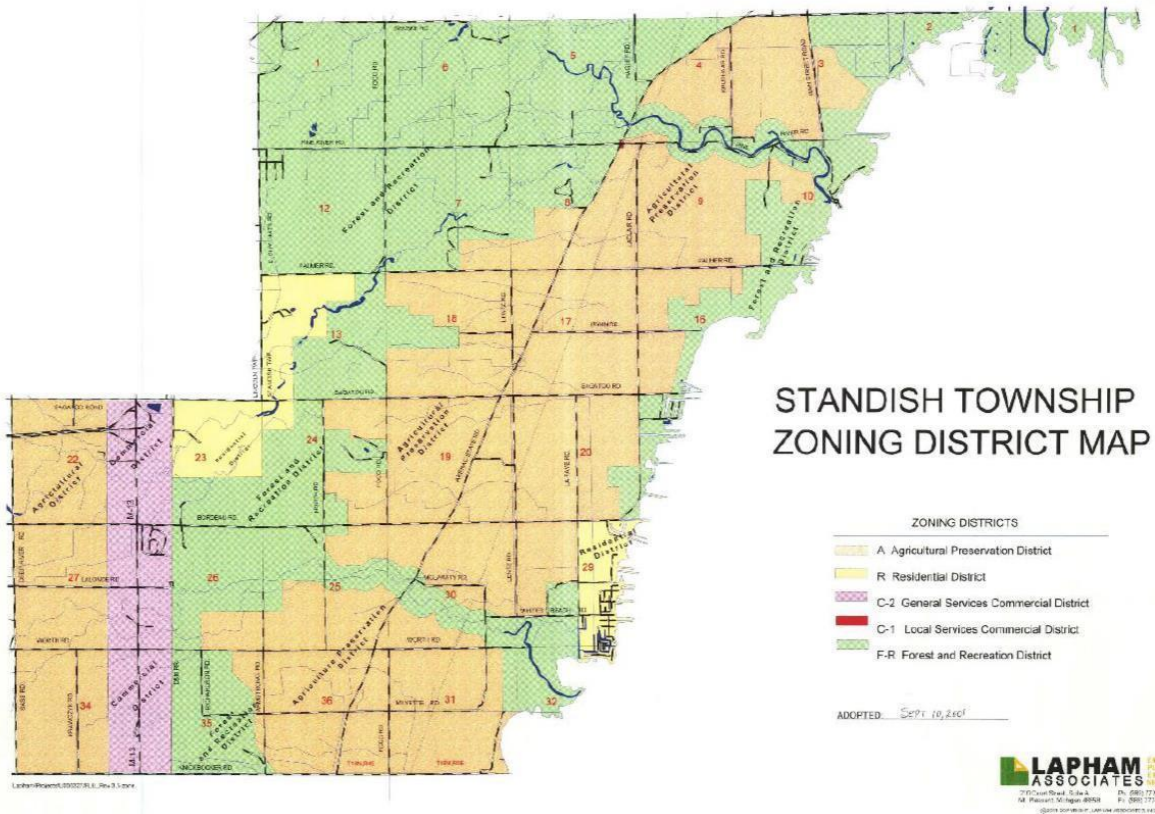


Figure 39: Standish Township Zoning Map

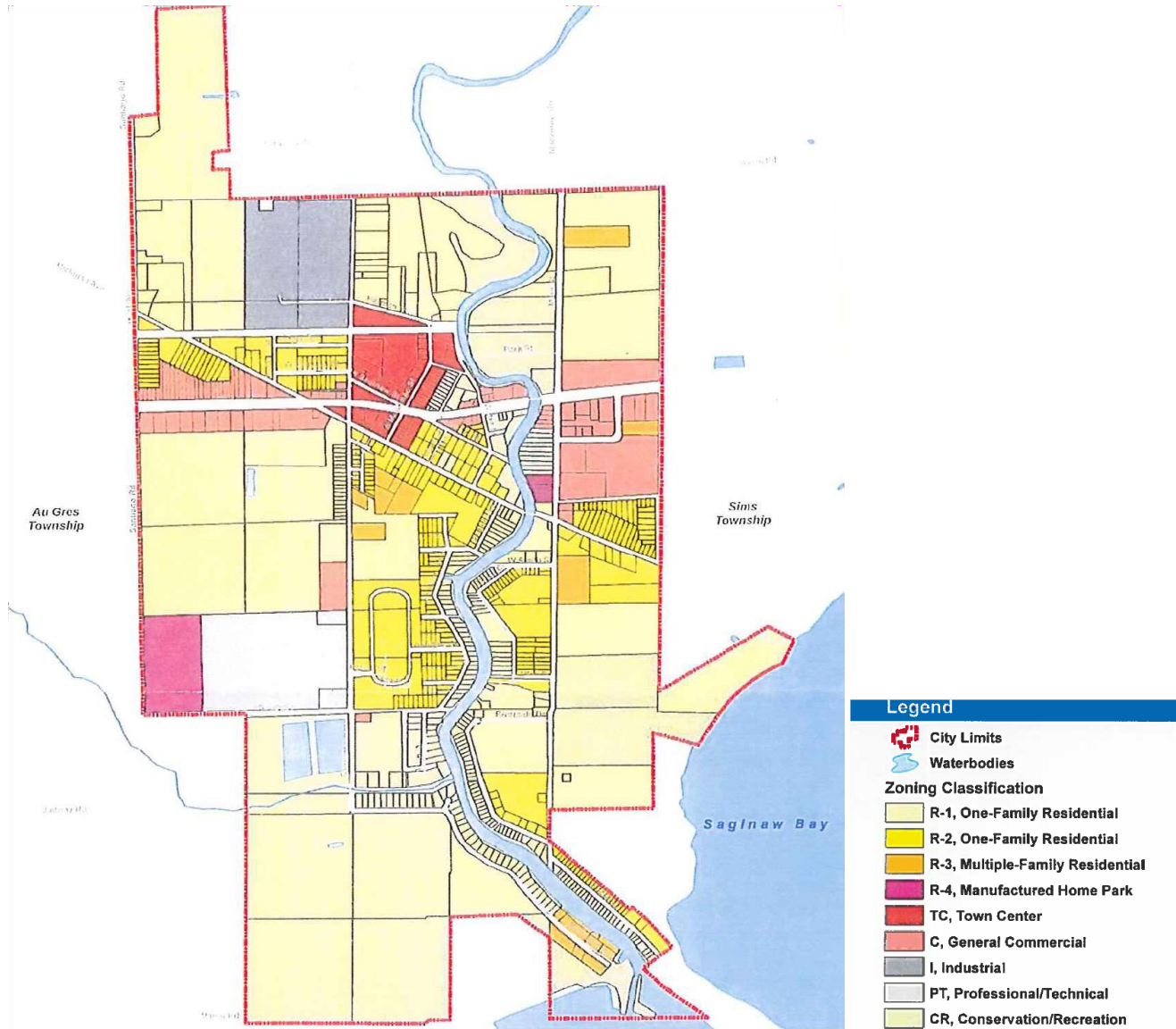


Figure 40: City of Au Gres Zoning Map

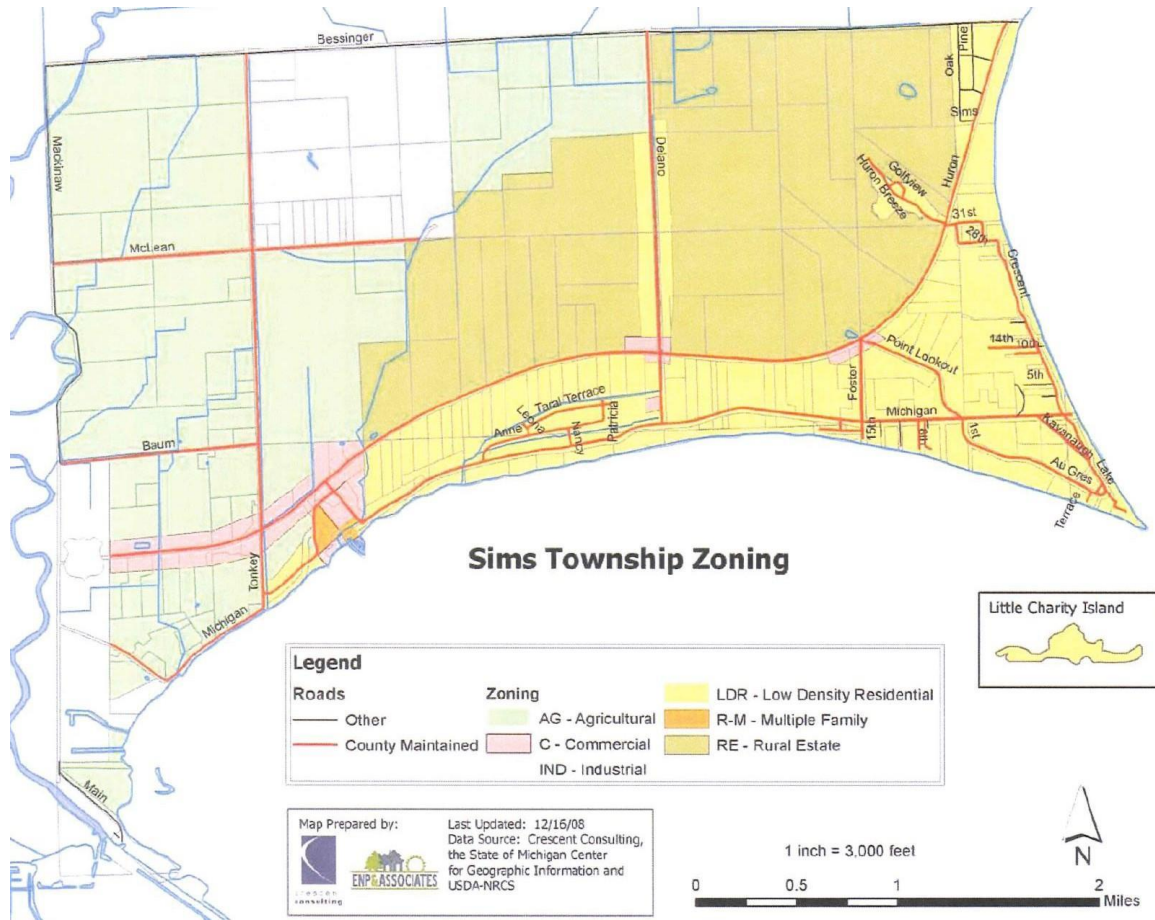
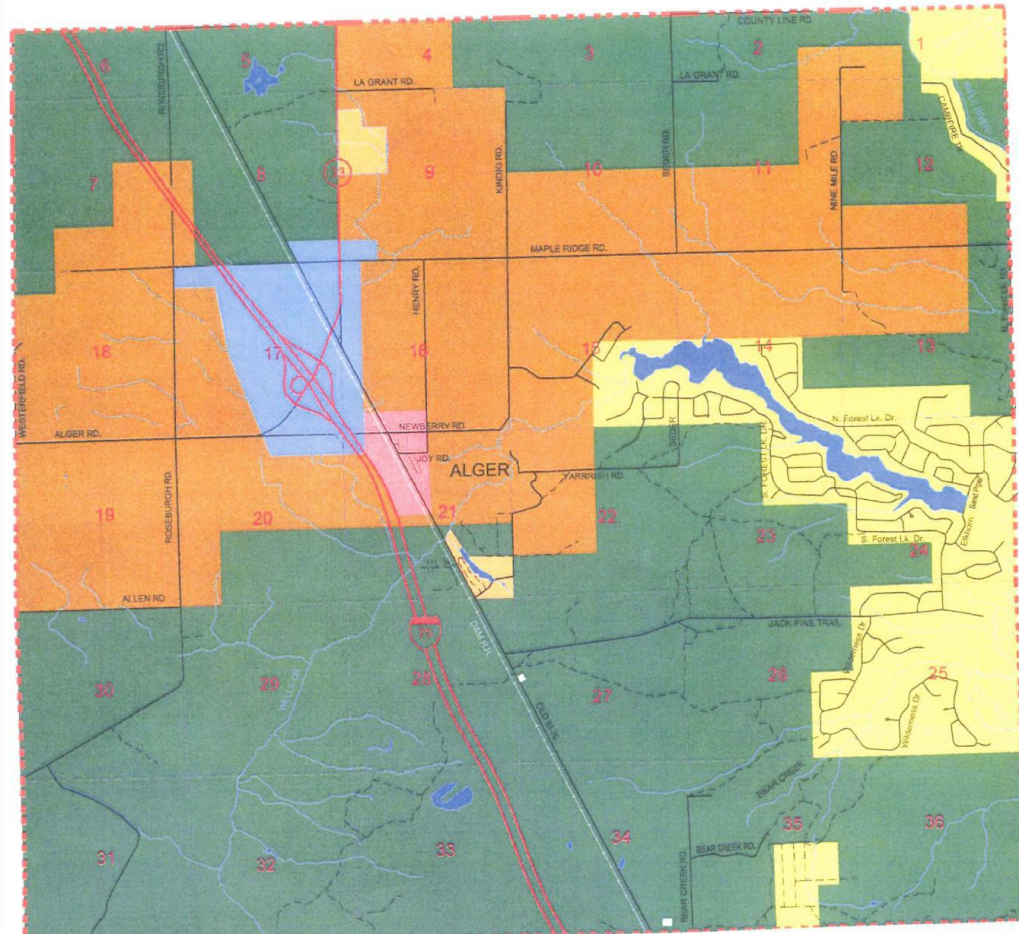


Figure 41: Sims Township Zoning Map

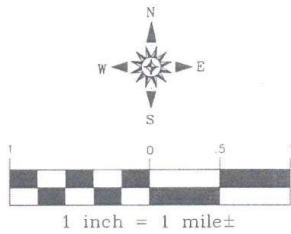


Source: Michigan Dept. of Natural Resources  
Michigan Resource Inventory System

MOFFATT TOWNSHIP, ARENAC COUNTY, MICHIGAN

Legend

- |   |              |
|---|--------------|
| Highway Commercial District               | Highways     |
| Agricultural / Rural Residential District | County Roads |
| Residential District                      | Streets      |
| Village Mixed Use District                | Two-Track    |
| Forested District                         |              |
| General Commercial District               |              |



**LAPHAM ASSOCIATES** ENGINEERING, PLANNING, ENVIRONMENTAL, SURVEYING

# Zoning District Map

Figure 42: Moffatt Township Zoning Map

# City of Omer Zoning Map

- Commercial
- R 1
- R 2
- R 3
- Recreational

CITY OF  
OMER  
ARENAC CO.  
T 19 N R 5E  
POP 403-1980 CENSUS

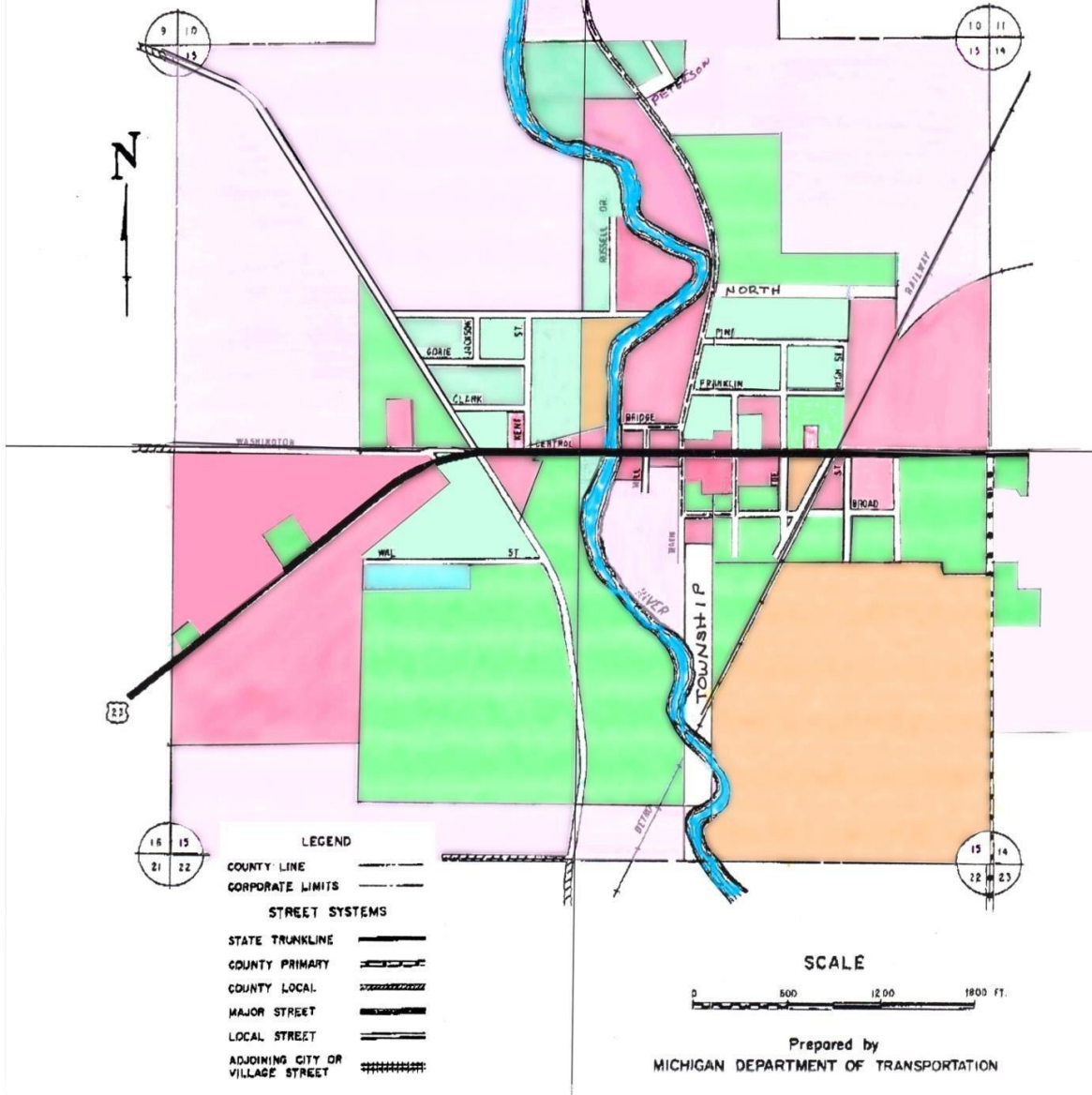
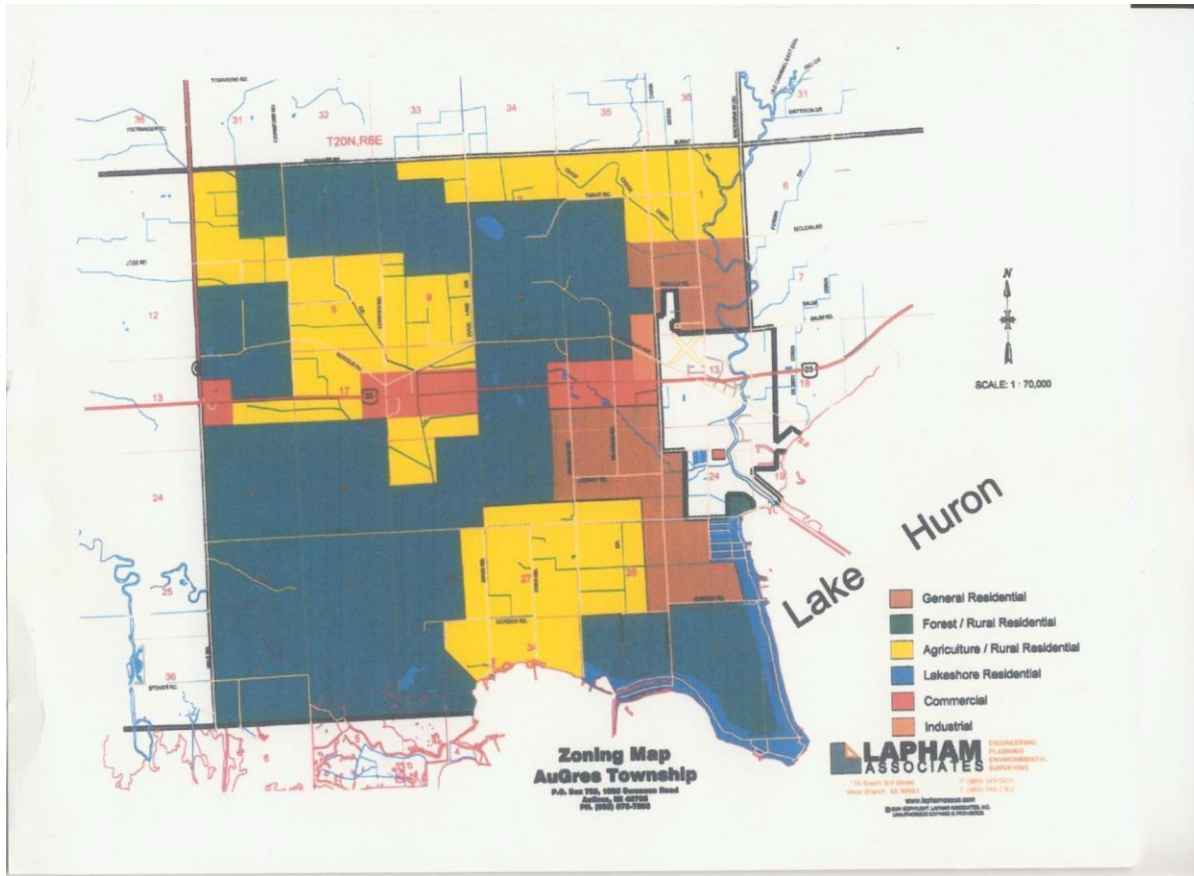


Figure 43: City of Omer Zoning Map



**Figure 44: Au Gres Township Zoning Map**

Other Zoning Maps are available from the county or the townships, villages, or cities.

The Arenac County Planning Commission plays the central role for land use planning in the county. The County Board of Commissioners and the Planning Commission participate in emergency planning through its Local Emergency Planning Committee (LEPC) and the Local Planning Team (LPT). Committee and team members are from the following agencies:

- Arenac County Emergency Management Coordinator
- Arenac County Board of Commissioners/Planning Commission
- Arenac County 911 Central Dispatch
- Arenac County Sheriff's Department
- Michigan Department of Human Services
- Arenac County Road Commission
- Radio Amateur Civil Emergency Service
- Michigan State Police, Emergency Management and Homeland Security Division
- American Red Cross/Arenac County
- Arenac County Fire Department/Fire Chiefs Association



Arenac County Community Emergency Response Team  
Emergency Management Systems

**Medical Centers**

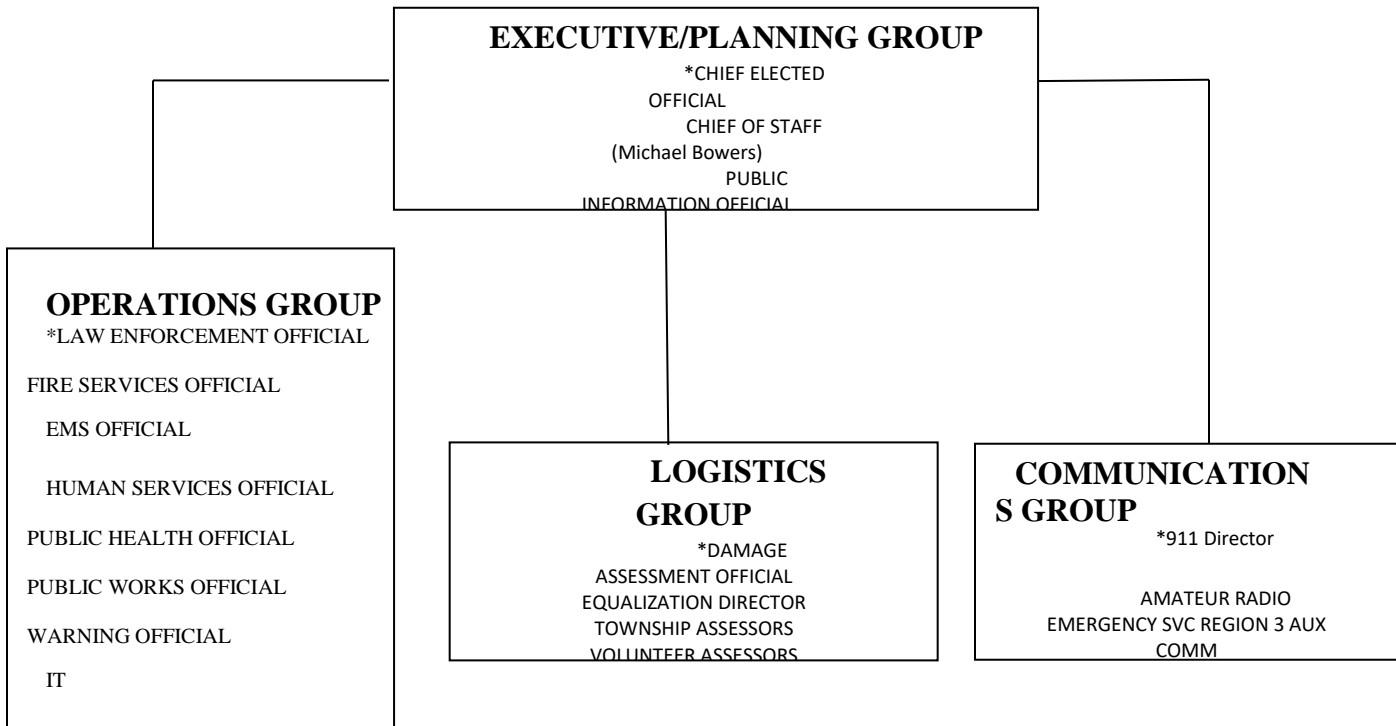
Sterling Area Health Center  
Au Gres Health Family Clinic  
Ascension Standish Hospital

**Assisted Living Facilities**

Eden Field Assisted Living  
Medilodge of Sterling, Nursing Home  
Au Gres Care Center  
Valley Residential Services

# ARENAC COUNTY EMERGENCY OPERATIONS CENTER ORGANIZATIONAL CHART (AS OF 03/2017)

**\*SIGNIFIES GROUP CHIEF**  
Named individual is Primary See EOC Call List for Alternates



### **Warning System**

**Arenac County is in the process of installing three total active warning sirens, one located in each city:**

City of Omer – 201 East Center Street

City of Standish – corner of Front Street and Washington Street

City of Au Gres – corner of Detroit Street and Riverside Drive

**Installation and activation are scheduled for completion in 2019.**

### **Emergency Services**

Emergency services are particularly important for the Hazard Mitigation Process. These services help serve the public in times of natural disasters and other emergency situations. It is crucial for the public to know where these services exist and how to reach them in times of need.

### **Emergency**

#### **Management**

Michael Bowers, Coordinator

120 N. Grove St.

P.O. Box 747

Standish, MI 48658

(989) 846-9156

For emergencies dial 911 or (989) 846-4561

### **911 Central Dispatch**

Arenac County has a central dispatch system, utilizing 911 for public to report emergencies. Central dispatch is staffed by eight full time and one part time dispatchers, and one full time director. They dispatch for five fire departments, three EMS stations, five police agencies, local DNR officers, animal control, and the coastguard. The 911 facility is located at 126 N. Grove Street in the City of Standish. Dispatching services utilize state of the art computer systems to receive emergency calls and to direct fire, and police to the emergency scene.

### **Ambulance**

In Arenac County, if one calls 911 for an ambulance the call taker will get some preliminary information and then transfer the call to the Mobile Medical Response (MMR) dispatch center in Saginaw which provides contractual EMS service from three EMS stations location in Standish, Au Gres, and Alger.

### **Police**

The Arenac County Sheriff's Office is located in Standish. Road patrol consists of nine full-time officers, one undersheriff, one sergeant, and one K9 dog. The Arenac County Jail is in Standish. They have nine full-time correction officers and three part-time correction officers. The jail houses 50 inmates. The City of Au Gres Police Department is located in Au Gres. The department consists of one Chief Officer. The City of Standish, Sims Township, and Au Gres Township contract with the Arenac County Sheriff's Department for police protection. The Saginaw Chippewa Tribal Police operates out of their

headquarters in Mt. Pleasant Michigan. They have 27 police officers, 11 dispatch/corrections personnel, and two administrative staff.

**Police Departments**

Arenac County Sheriff's Department

126 Grove Street  
Standish, MI 48658  
989-846-3002

Arenac County Jail

126 Grove Street  
Standish, MI 48658  
989-846-3002

Saginaw Chippewa Tribal Police Department/Saganing Eagles Landing Casino

6954 E. Broadway Street  
Mt. Pleasant, MI 48858

**Fire**

The population and government units of Arenac County depend upon five separate fire departments. Each local fire department has a fire chief and at least one assistant fire chief.

**Fire Departments**

Moffatt Township Volunteer Fire Department

1590 M-76  
Alger, MI 48610  
(989) 836-2908

Standish Area Fire Authority Station 13

317 N. Main St.  
Omer, MI 48749  
(989) 653-2211

Standish Area Fire Authority Station 12

909 W. Cedar  
Standish, MI 48658  
(989) 846-9155

Sterling Area Fire Department

510 E. State St.  
Sterling, MI 48659  
(989) 654-2444

Twining Mason Turner Fire Department

311 W. Main Street

Twining, MI 48766  
(989) 867-4665

Au Gres Sims Whitney Fire Authority & Rescue  
201 Court Street  
Au Gres, MI 48703  
(989) 876-6503



Figure 50: Arenac County Fire Department Locations

**State of Michigan Department of Health and Human Services**

Central Michigan District Health Department  
James Travis, Environmental Health Supervisor  
Jaime Kimmerer, Personal Health Supervisor  
4489 W. M-61, Ste. 3  
Standish, MI 48658  
(989) 846-6514

**Hospitals and Health Facilities**

Ascension Standish Hospital  
805 W. Cedar St.  
Standish, MI 48658  
(989) 846-4521

St. Joseph Health Systems, Inc.  
3210 E. Huron Rd.  
Au Gres, MI 48703  
(989) 876-7104

Sterling Area Health Center  
James J. Balten Jr., President & CEO  
725 E. State St.  
Sterling, MI 48659

(989) 654-2491

**Drain Commissioner**

Jeff Trombley  
120 N. Grove  
P.O. Box 747  
Standish, MI 48658  
(989) 846-2011

**Government Facilities**

Government facilities may have a large impact on how emergencies are handled. They provide services to the public such as shelter in times of natural disasters. They also serve as a way to distribute information on how to handle emergency circumstances.

**Government Offices and Facilities (Main Office Locations)**

**Townships**

Adams Township  
6600 Sterling Rd.  
Sterling, MI 48659  
(989) 654-3570

Arenac Township  
2596 State Rd.  
Standish, MI 48658  
(989) 653-2319

Au Gres Township  
1865 S. Swenson Rd.  
Au Gres, MI 48703  
(989) 876-7293

Clayton Township  
1057 Dobler Rd.  
Sterling, MI 48659  
(989) 654-2414

Deep River Township  
511 E. State St.  
Sterling, MI 48659  
(989) 654-3161

Lincoln Township  
5173 Hohnsfield Rd.  
Standish, MI 48658

(989) 846-0097

Mason Township  
1225 Maple Ridge Rd.  
Twining, MI 48766  
(989) 867-4216

Moffatt Township  
7842 Newberry  
Alger, MI 48610  
(989) 836-2452

Sims Township  
4489 E. Huron Rd.  
Au Gres, MI 48703  
(989) 876-8631

Standish Township  
4997 Arenac State Rd.  
Standish, MI 48658  
(989) 846-6442

Turner Township  
110 Park St.  
Twining, MI 48766  
(989) 876-4045

Whitney Township  
1515 N. Huron Rd.  
Tawas City, MI 48763  
(989) 362-5528

**Villages**

Village of Sterling  
137 E. Main St.  
Sterling, MI 48659  
(989) 654-3456

Village of Turner  
109 W. Main St.  
Turner, MI 48798  
(989) 867-4707

Village of Twining

311 W. Main St.  
Twining, MI 48766  
(989) 867-4688

**Cities**

City of Au Gres  
124 E. Huron  
Au Gres, MI 48703  
(989) 876-8811

City of Standish  
399 E. Beaver St.  
Standish, MI 48658  
(989) 846-9588

City of Omer  
201 E. Center St.  
Omer, MI 48749  
(989) 653-2566

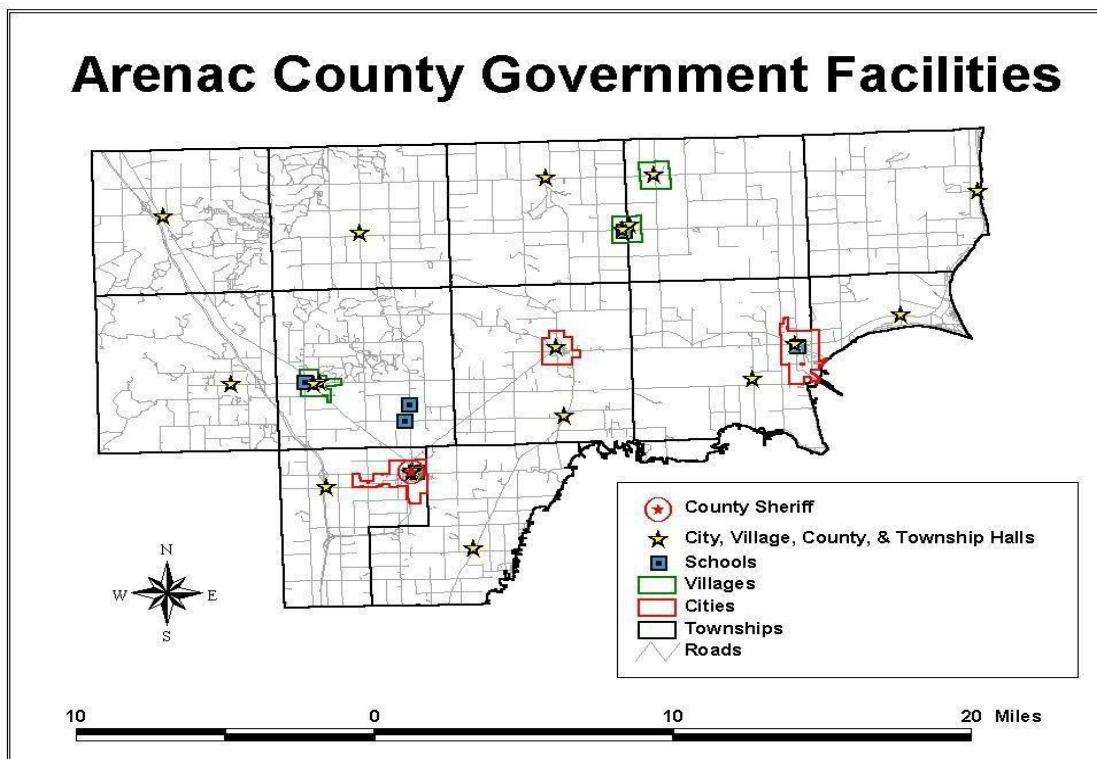


Figure 51: Arenac County Governmental Facilities Map



**Schools**

Au Gres-Sims School District  
140 S. Court St.  
Au Gres, MI 48703  
(989) 876-7157

Standish-Sterling Community Schools  
3789 Wyatt Rd.  
Standish, MI 48658  
(989) 846-3670

Tawas Area Schools  
245 W. M55  
Tawas City, MI 48763  
(989) 984-2251

Whittemore Prescott Area Schools  
8970 Prescott Rd.  
Whittemore, MI 48770  
(989) 756-2500

**Regional Higher Education Institutions**

Delta College  
1961 Delta Rd.  
University Center, MI 48710  
(989) 686-9000

Kirtland Community College  
Central campus in Roscommon  
Extensions in West Branch and Gaylord  
(989) 275-5000

Saginaw Valley State University  
7400 Bay Rd.  
University Center, MI 48710  
(989) 964-4000

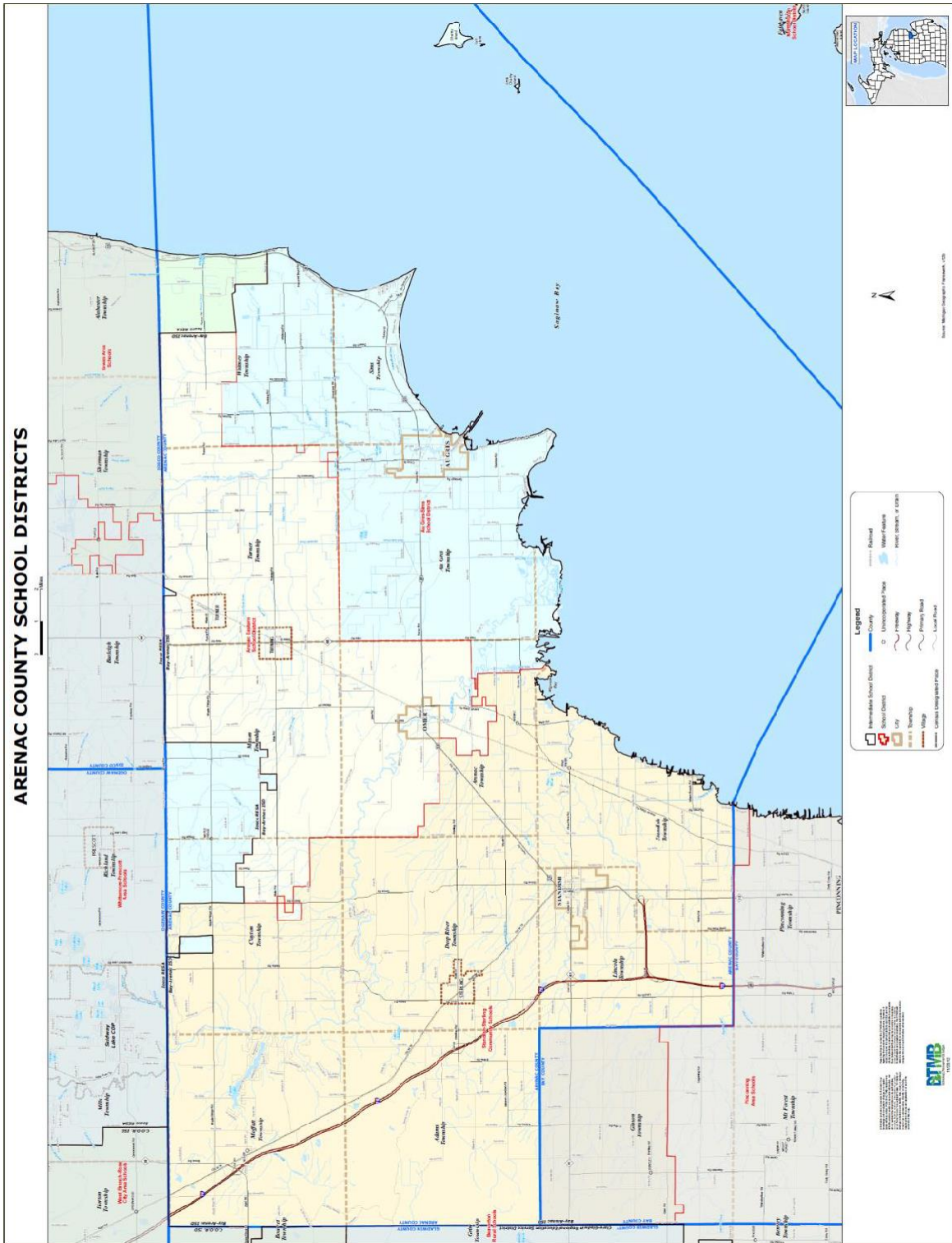


Figure 52: Arenac County School Districts Map

### **Service Agencies**

#### **Utilities**

Arenac County and its municipalities are serviced by Consumers Energy and DTE. Consumers Power Company supplies electric power to customers through the county and natural gas to the major population areas. Telephone service is provided by several companies. Century Link provides service to the cities of Au Gres and Omer and a few other areas with the “876, 210, 558, 367, 456, 653” exchanges. Service in Standish with the “846, 718, 314, 903” exchanges are received through Ameritech and AT&T. The Pigeon Telephone Company supplies service to Mason and Turner Townships including the Villages of Turner and Twining and parts of Au Gres Township with the “867, 342” exchanges. Service to Sterling with a “654, 524” exchange, Alger with the “836, 825, 520” exchanges are provided by Alltel Michigan, Inc.

#### **Solid Waste**

Michigan has active landfills throughout the State of Michigan according to the Department of Natural Resources. Republic Services of Michigan, commonly known as White-feather Landfill is the closest landfill located in Bay County. Arenac County is serviced by Waste Management, Sunrise Disposal, and Republic Services.

### **Transportation**

There are five state highways in Arenac County. M-13, M-65, M-33, M-76 are north/south roads, and M-61 is an east/west truck line. The county and local governments maintain the remaining road networks. Interstate Highway I-75 and Highway US-23 are major transportation trunk lines in Arenac County.

The nearest airport supporting general passenger travel is the MBS International Airport located in Freeland (Saginaw County), approximately 40 miles southwest of Standish. The airport is served by 13 single-engine and 5 multi-engine aircraft, 9 jets, and 1 helicopter. Arenac County has a county-wide public transportation system – the Arenac County Transit - through Arenac County Economic Development (EDC).

Freight is trucked within the county by local trucking companies. The Lake State Railway serves Arenac County with two lines. UPS and Fed-Ex serves all of Arenac County.



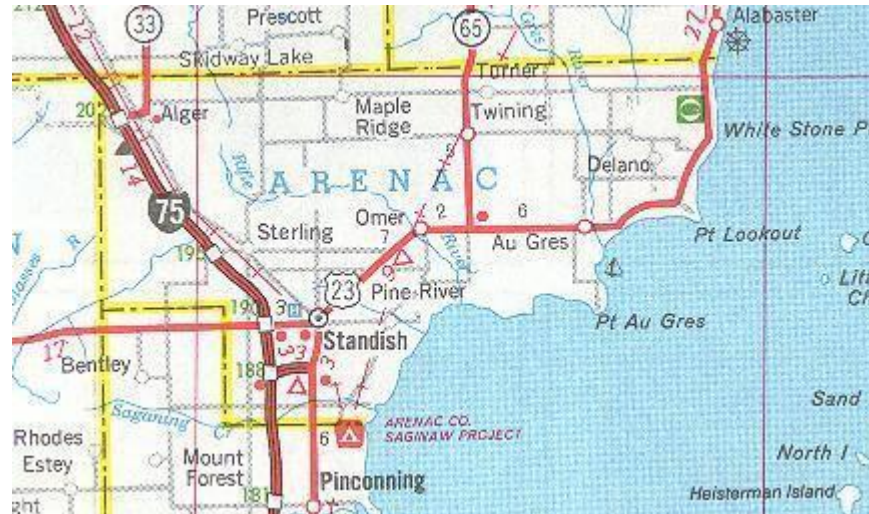
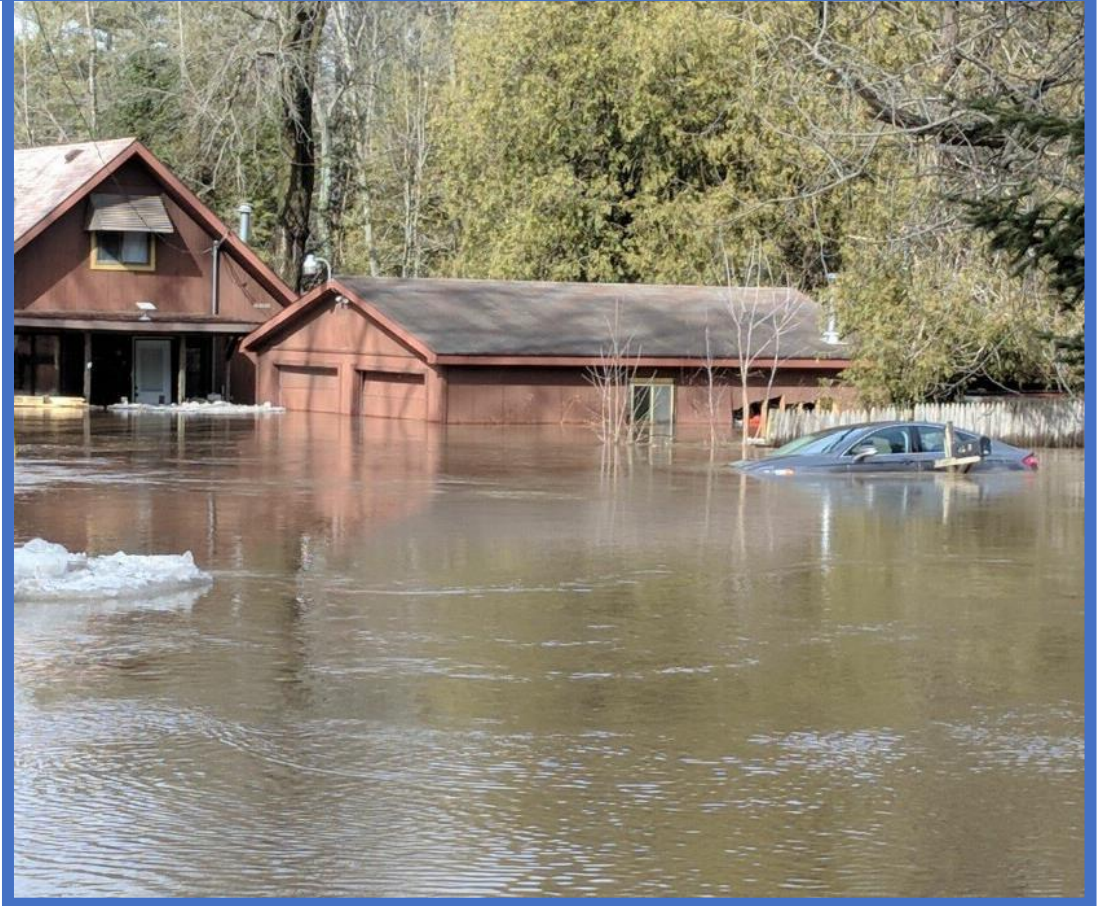


Figure 53: Arenac County Road Map

Arenac County Road Commission  
4271 Airpark Drive  
Standish, MI 48658  
(989) 718-3280

Arenac County Transit  
4358 Airpark Dr.  
Standish, MI 48658  
(989)-846-7500

# Chapter 4 *Risk Assessment*



In this section county hazards are identified, described, and analyzed. The county community’s capabilities and assets will be reviewed against those risks and a summary of vulnerabilities will be set out. Charts show historic events with more recent events noted before the charts.

**DISASTER, DESCRIPTION and HISTORY**

**Thunderstorm Hazards**

Hailstorms

A condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth.

Hazard Description

Hail is a product of strong thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have been reported. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado.

Hailstorms in Arenac County

**41 HAIL** event(s) were reported in **Arenac County, Michigan** between **07/08/1977** and **07/08/2016**.

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Arenac (Zone)	7/8/1977	1220	Hail	1	0	0	0	0
Shelby	8/3/1993	1640	Hail	0.88	0	0	0	0
Standish	8/3/1993	1910	Hail	0.75	0	0	0	0
Sterling	6/28/1994	1252	Hail	0.75	0	0	0	0
Twining	7/6/1994	1720	Hail	0.75	0	0	0	0
Standish	5/18/1996	1120	Hail	1	0	0	0	0
Twining	6/13/1996	2010	Hail	1.75	0	0	0	0
Au Gres	6/13/1996	2015	Hail	1.75	0	0	0	0
Delano	8/7/1996	1610	Hail	0.88	0	0	0	0
Standish	5/8/1997	2110	Hail	1	0	0	0	0
Alger	7/2/1997	1435	Hail	0.75	0	0	0	0
Alger	7/2/1997	1444	Hail	1	0	0	0	0
Alger	7/2/1997	1446	Hail	1.25	0	0	0	0
Sterling	7/2/1997	1453	Hail	1.5 in.	0	0	0	0
Alger	7/2/1997	1540	Hail	1 in.	0	0	0	0
Au Gres	7/14/1997	1925	Hail	0.75 in.	0	0	0	0

**Arenac County Hazard Mitigation Plan 2021**

Standish	6/24/1998	1651	Hail	1.75 in.	0	0	0	0
Alger	6/24/1998	1810	Hail	1 in.	0	0	0	0



## Arenac County Hazard Mitigation Plan 2021

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Sterling	9/26/1998	630	Hail	3.5 in.	0	0	0	0
Sterling	9/26/1998	630	Hail	1 in.	0	0	0	0
Standish	5/23/2000	2030	Hail	1 in.	0	0	0	0
Sterling	5/28/2001	1741	Hail	0.75 in.	0	0	0	0
Sterling	7/22/2001	1705	Hail	0.88 in.	0	0	0	0
Standish	8/30/2001	2153	Hail	0.75 in.	0	0	0	0
Sterling	6/8/2005	200	Hail	0.88 in.	0	0	0	0
Standish	6/28/2006	1455	Hail	1 in.	0	0	0	0
Sterling	10/2/2006	1555	Hail	0.75 in.	0	0	0	0
Twining	10/2/2006	1615	Hail	1 in.	0	0	0	0
Au Gres	7/5/2007	1600	Hail	1 in.	0	0	0	0
Sterling	7/9/2007	1510	Hail	0.75 in.	0	0	0	0
Au Gres	6/8/2008	1448	Hail	2 in.	0	0	0	0
Alger	9/20/2008	1944	Hail	0.75 in.	0	0	0	0
Sterling	4/10/2011	630	Hail	0.75 in.	0	0	0	0
Sterling	4/10/2011	709	Hail	0.88 in.	0	0	0	0
Au Gres	4/26/2011	1949	Hail	1 in.	0	0	0	0
Au Gres	4/26/2011	2000	Hail	0.75 in.	0	0	0	0
Worth	5/3/2012	1537	Hail	1 in.	0	0	0	0
Sterling	5/30/2013	1516	Hail	1 in.	0	0	0	0
Sterling	8/2/2015	1245	Hail	1.75 in.	0	0	10000	0
Au Gres	8/2/2015	1642	Hail	1.5 in.	0	0	0	0
Standish	7/8/2016	1407	Hail	1.5 in.	0	0	0	0
<b>TOTALS</b>					<b>0</b>	<b>0</b>	<b>10000</b>	<b>0</b>

**Table 23** - Source: National Climatic Data Center

As is illustrated in the historic data above, there is a high probability of hail events at least every few years almost anywhere in the county. Fortunately, the hail events have not caused serious consequences.

### National Weather Service Doppler Radar

The National Weather Service (NWS) Doppler Weather Surveillance Radar can detect severe weather events that threaten life and property, including storms that are likely to produce damaging hail and lightning. With Doppler Radar the lead time and specificity of warnings for severe weather have improved significantly. Doppler technology calculates both the speed and the direction of severe storms. By providing data on the wind patterns within developing storms, the new system allows forecasters to identify better the conditions leading to severe weather such as tornadoes, strong winds, lightning and damaging hail: This means early detection of the precursors to severe storms, as well as information on the direction and speed of storms once they form.

### National Weather Service Watches/Warnings

The National Weather Service (NWS) issues severe thunderstorm watches when the meteorological conditions are conducive to the development of a severe thunderstorm. People in the watch area are instructed to stay tuned to local radio or television stations for weather updates and to watch for developing storms. Once radar or a trained Skywarn spotter detects the existence of a severe thunderstorm, the NWS will issue a severe thunderstorm warning. The warning will identify where the storm is located, the direction in which it is moving, and the time frame during which the storm is expected to be in the area. People in the warning area are instructed to seek shelter immediately.

State and local officials are warned of severe thunderstorms via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio, or the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The NWS stations in Michigan provide information directly to radio and television stations, which in turn pass the warning on to the public. The NWS also provides detailed warning information on the Internet through the Interactive Weather Information Network (IWIN).

The NWS also has an extensive public information program aimed at educating citizens about the dangers of lightning and other severe weather, and ways to prevent weather-related deaths and injuries.

### Severe Weather Awareness Week

Each spring, the Michigan Department of State Police, Emergency Management Division, in conjunction with the Michigan Committee on Severe Weather Awareness, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on severe weather events such as tornadoes, thunderstorms, lightning, high winds, flooding, and hail. Informational materials on hail and other thunderstorm hazards are given to schools, hospitals, nursing homes, other interested community groups and facilities, and the public.

### Hail Overview

Annually, thunderstorms will occur an average of 30 days in Arenac County. Most occur in June, July, and August. The incidence of hail follows the incidence of thunderstorms. Therefore, those areas of the state most prone to thunderstorms are also prone to large and damaging hail.

The National Weather Service, which began recording hail activity in Michigan in 1967, indicates that approximately 50% of the severe thunderstorms that produce hail have occurred during the months of June and July. Nearly 80% have occurred during the prime growing season of May through August. As a result, the damage to crops is often extensive.

The National Weather Service forecasts of severe thunderstorms usually gives sufficient warning time to allow residents to take appropriate action to reduce the effects of hail damage to vehicles and some property. Public education and awareness of the dangers posed by these natural hazards is the best defense against thunderstorms and the hail that often accompanies them.

Lightning

The discharge of electricity from within a thunderstorm.

Hazard Description

Most direct impacts from lightening are relatively site specific in scope, and therefore do not have a tremendous impact on the community. With the temperature of a bolt of lightning approaching 50,000 degrees Fahrenheit in a split second, the most common direct damage from lightning is fire. The most common indirect effect of lightning is power outages. This indirect effect can have an impact on a much larger segment of the community, leaving hundreds and sometimes thousands of homes without electricity.

Lightning Events in Arenac County

**1 LIGHTNING** event was reported in **Arenac County, Michigan** on **7/15/2010**.

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Standish	7/15/2010	1336	Lightning	N/A	0	0	500	0
<b>TOTALS</b>					<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>

Table 24 - Source: National Climatic Data Center

National Weather Service Education

The National Weather Service issues severe thunderstorm watches and warnings when there is a threat of severe thunderstorms. However, lightning, by itself, is not sufficient criteria for the issuance of a watch or warning (every storm would require a watch or warning). The National Weather Service has an extensive public information program aimed at educating citizens about the dangers of lightning and ways to prevent lightning-related deaths and injuries.

Severe Weather Awareness Week

Each spring, the Emergency Management Division, Michigan Department of State Police, in conjunction with the Michigan Committee for Severe Weather Awareness, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on such severe weather events as tornadoes, thunderstorms, hail, high winds, flooding and lightning. Informational materials on lightning hazards are disseminated to schools, hospitals, nursing homes, other interested community groups and facilities, and the general public.

Lightning Protection for Structures

The National Lightning Safety Institute (NLSI) has identified a systematic lightning hazard mitigation approach that can be followed to protect structures from lightning damage. That approach attempts to mitigate both the direct and indirect effects of lightning strikes though the application of appropriate structural safety improvements, as identified in a comprehensive lightning safety analysis.

### National Lightning Detection Network

Despite advancements in electric power system design and equipment, lightning continues to be the single largest cause of outages on electrical distribution and transmission lines. To help combat that problem, the National Lightning Detection Network (NLDN) – a technologically advanced lightning location system operated by a private company in Phoenix, Arizona – was invented. The NLDN helps electric utilities make effective decisions regarding line maintenance priorities, crew dispatch, and future design and placement of utility transmission lines and lightning protection. NLDN lightning data is available in both real-time and archival format (1989-present). The lightning information from NLDN can lead to significant savings to utility maintenance and construction budgets, improved design and placement of future transmission and distribution infrastructure, and reduced outages due to lightning-related damage. Data from the NLDN can also be used to improve the safety of participants at outdoor events such as golf tournaments, air shows, fairs and outdoor festivals, and sporting events and concerts at outdoor stadiums and racetracks.

### Local Lightning Detection Systems

Local lightning detection systems are increasingly being installed at golf courses, parks, pools, sports fields and stadiums, and other outdoor venues. These detection devices monitor electrical activity in the atmosphere and identify when favorable lightning conditions exist by activating a warning light or horn. That early warning can give local officials the time necessary to clear outdoor areas before actual lightning strikes occur.

### Thunderstorm Hazards – Lightning Overview

Unfortunately, lightning prevention or protection in an absolute sense is impossible. However, the consequences of lightning strikes have been diminished (both in terms of deaths and injuries and property damage) through the implementation of the above programs and special initiatives and there have been very few events reported.

### Severe Winds

Winds 58 miles per hour or greater.

### Hazard Description

Severe winds spawned by thunderstorms and other weather events can have devastating effects in terms of loss of life, injuries, and property damage. According to data compiled by the National Weather Service for the period 1957-2016, Michigan experienced 127 high wind events (60 kt. or higher) that resulted in 1 death and over 10 million dollars in damage. One of the major problems associated with windstorms is the loss of electrical power and associated services. Windstorms also cause property damage from falling tree limbs and other flying debris.

## Arenac County Hazard Mitigation Plan 2021

### Wind Events in Arenac County

Locations that are not specified in the Location and County category are larger and on a bigger scale than Arenac County.

**46 THUNDERSTORM & HIGH WIND** event(s) were reported in **Arenac County, Michigan** between **04/25/1957** and **07/08/2016**.

Location	Date	Time	Type	Mag	Dt h	Inj	PrD	CrD
Arenac (Zone)	11/10/1998	500	High Wind	50kts.	0	0	0	0
Arenac (Zone)	3/9/2002	1800	High Wind	50kts.	0	0	0	0
Arenac (Zone)	11/13/2005	1300	High Wind	50kts	0	0	5000	0
Arenac Co.	4/25/1957	1118	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	7/24/1961	1400	Thunderstorm	0 kts.	0	0	0	
Arenac Co.	6/20/1979	1245	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	6/20/1979	1245	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	8/3/1988	1430	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	8/27/1990	1938	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	3/27/1991	1830	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	3/27/1991	2130	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	5/29/1991	2145	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	6/17/1992	1625	Thunderstorm	0 kts.	0	0	0	0
Arenac Co.	6/17/1992	1627	Thunderstorm	0 kts.	0	0	0	0
Ferry	8/3/1993	1910	Thunderstorm	0 kts.	0	0	5000	0
Standish	7/6/1994	1815	Thunderstorm	0 kts.	0	0	0	0
Sterling	7/13/1995	1630	Thunderstorm	0 kts.	0	0	0	0
Twining	7/16/1997	1530	Thunderstorm	52 kts.	0	0	0	0
Standish	5/31/1998	530	Thunderstorm	50 kts.	0	0	0	0
Turner	5/8/2000	2346	Thunderstorm	50 kts.	0	0	0	0
Au Gres	7/28/2002	410	Thunderstorm	50 kts.	0	0	0	0
Alger	9/19/2002	1630	Thunderstorm	50 kts.	0	0	0	0
Standish	5/12/2004	1610	Thunderstorm	60 kts.	0	0	10000	0
Turner	8/2/2004	1645	Thunderstorm	52 kts.	0	0	0	0
Au Gres	8/27/2004	615	Thunderstorm	55 kts.	0	0	0	0
Twining	7/18/2005	1319	Thunderstorm	55 kts.	0	0	12000	0

**Arenac County Hazard Mitigation Plan 2021**

Turner	7/17/2006	1816	Thunderstorm	52 kts.	0	0	4000	0
Sterling	7/9/2007	1510	Thunderstorm	54 kts.	0	0	8000	0
Sterling	6/6/2008	1622	Thunderstorm	55 kts.	0	0	34000	0
Sterling	6/8/2008	1440	Thunderstorm	55 kts.	0	0	10000	0

Location	Date	Time	Type	Mag	Dt h	Inj	PrD	CrD
Arenac Co.	8/13/2008	1415	Thunderstorm	50 kts.	0	0	500	0
Maple Ridge	7/15/2010	1325	Thunderstorm	52 kts.	0	0	3000	0
Santiago	7/15/2010	1350	Thunderstorm	52 kts.	0	0	2000	0
Sterling	7/15/2010	1353	Thunderstorm	55 kts.	0	0	10000	0
Maple Ridge	7/15/2010	1408	Thunderstorm	52 kts.	0	0	3000	0
Maple Ridge	5/22/2011	1456	Thunderstorm	60 kts.	0	0	16000	0
Omer	5/27/2012	1435	Thunderstorm	50 kts.	0	4	27000	0
Sterling	5/20/2013	1553	Thunderstorm	55 kts.	0	0	45000	0
Twining	5/20/2013	1605	Thunderstorm	54 kts.	0	0	4000	0
Santiago	7/19/2013	1815	Thunderstorm	52 kts.	0	0	6000	0
Maple Ridge	11/17/2013	1650	Thunderstorm	54 kts.	0	0	5000	0
Sterling	11/17/2013	1700	Thunderstorm	56 kts.	0	0	18000	0
Sterling	8/2/2015	1245	Thunderstorm	55 kts.	0	0	20000	0
Omer	8/14/2015	1535	Thunderstorm	52 kts.	0	0	5000	0
Twining	6/6/2016	1439	Thunderstorm	55 kts.	0	0	18000	0
Standish	7/8/2016	1415	Thunderstorm	54 kts.	0	0	9000	0
<b>TOTALS</b>					<b>0</b>	<b>4</b>	<b>324,500</b>	<b>0</b>

**Table 25** - Source: National Climatic Data Center

Severe thunderstorms and high winds occur at least biannually throughout Arenac County. The storms cause some property damage, but no deaths or injuries have been reported.

Existing Prevention Programs

Many of the programs and initiatives designed to mitigate against, prepare for, respond to, and recover from tornadoes have the dual purpose of also protecting against other strong winds. As a result, there is some overlap in the narrative programs and initiatives descriptions for each respective hazard.

National Weather Service Doppler Radar

The National Weather Service (NWS) has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property – including severe winds. Most important, the lead time and specificity of warning for severe weather have improved significantly.

Doppler technology calculates both the speed and the direction of motion of severe storms. By providing data on the wind patterns within developing storms, the new system allows forecasters to better identify the conditions leading to severe weather such as tornadoes and severe straight-line winds. This means early detection of the precursors to severe storms, as well as information on the direction and speed of storms once they form.

### National Weather Service Watches/Warnings

The National Weather Service issues severe thunderstorm watches for areas when the meteorological conditions are conducive to the development of severe thunderstorms. People in the watch area are instructed to stay tuned to National Oceanic and Atmospheric Administration (NOAA) weather radio and local radio or television stations for weather updates and watch for developing storms. Once radar or a trained Skywarn spotter detects the existence of a severe thunderstorm, the National Weather Service will issue a severe thunderstorm warning. The warning will identify where the storm is located, the direction in which it is moving, and the time frame during which the storm is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), NOAA weather radio, and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).

### Public Warning Systems

Numerous communities in Michigan have outdoor warning siren systems in place to warn the public about impending tornadoes and other hazards. Most of these systems were originally purchased to warn residents of a nuclear attack, but that purpose was expanded to include severe weather hazards as well. These systems can be highly effective at saving lives in densely populated areas where the siren warning tone is most audible. In more sparsely populated areas where warning sirens are not as effective, communities are turning to NOAA weather alert warning systems to supplement or supplant outdoor warning siren systems. Unfortunately, many communities across the state do not have adequate public warning systems in place to warn their residents of severe weather or other hazards. Federal funding specifically allocated to assist communities in the purchase of public warning systems has effectively disappeared, leaving many communities unable to purchase adequate systems to warn their residents of impending danger. Arenac County will have three outdoor warning sirens active by the end of 2019 in the cities of Standish, Omer, and Au Gres.

Attempting to fill some of that funding void, the State of Michigan has used federal Hazard Mitigation Grant Program (HMGP) funds to assist local communities in purchasing public warning systems. To date, HMGP funds have been used to purchase and install 76 outdoor warning sirens, over 1,000 NOAA weather alert monitors for schools, hospitals and places of public assembly, 4 NOAA weather radio transmitters, and several other early warning systems. Communities that received funding for these projects were encouraged to implement a warning education program to ensure that residents know what to do once they receive warning of an impending hazardous event. Because HMGP funds must be used to fund a wide variety of mitigation projects, the amount of funds available to fund warning systems is limited to a small percentage of the overall available grant funds allocated to the state. The HMGP funds are provided on a 75% federal, 25% local cost share. A Presidential Major Disaster Declaration is required to activate the HMGP funding. As a result, the funding stream may not always be available. In addition, state mitigation priorities may change over time, putting public warning systems at a lower priority than other mitigation projects. However, the HMGP does provide



at least one possible avenue for assisting communities in enhancing their local public warning capability.

### Severe Weather Awareness Week

Each spring, the Emergency Management Division, Department of State Police, in conjunction with the Michigan Committee for Severe Weather Awareness, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on severe weather events such as tornadoes, thunderstorms, lightning, hail, flooding and high winds. Informational materials on severe winds and other weather hazards are disseminated to schools, hospitals, nursing homes, other interested community groups and facilities, and the general public.

### Manufactured Home Anchoring

Manufactured homes are vulnerable to wind damage if they are not properly anchored. As a result, a major national effort has been initiated to encourage the structural anchoring or “tie down” of manufactured homes. The Michigan Manufactured Housing Commission Administrative Rules (R 125.1602, Subsection 5) required new manufactured home installation in floodplains to be anchored structurally to a foundation. Through this requirement, the possibility of damage from wind is minimized. Unfortunately, structures outside designated floodplains do not have to comply with the anchoring provision, although many owners choose to comply voluntarily. It should also be noted that local communities have the option of adopting an ordinance that requires anchoring of manufactured home installations located outside a designated floodplain. State anchoring system standards are outlined in Administrative Rules R 125.1605 through R 125.1608.

### Electrical Infrastructure Reliability

One of the major problems associated with severe winds is the loss of electric power. As illustrated above, Michigan has had numerous widespread and severe electrical power outages caused by severe winds, and several of those outages have resulted in upwards of 500,000 electrical customers (roughly 5% of the State’s population) being without power for several hours to several days at a time. Wind-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. DTE, Consumers Energy, and other major electric utility companies and cooperatives have active, ongoing programs to improve system reliability and protect facilities from damage by severe winds and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution lines underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages. The threat of Cyber Intrusion remains a looming threat; mitigation of this is primarily placed on the individual power companies to secure their networks. Currently exists no statewide or federal mandate for the level of security that private power companies must maintain to be able to operate. The reason for this is all power generation in the State is owned by private companies; who are allowed to operate under their own mandates and regulations.

### Structural Bracing/Wind Engineering

One of the best ways to protect buildings from damage from severe winds is to install structural bracing and metal connectors (commonly called hurricane clips) at critical points of connection in the frame of

the structure. Typically, this involves adding extra gable end bracing at each end of the structure, anchoring the roof rafters to the walls with metal connector straps, and properly anchoring the walls and sill plates to the foundation. This extra bracing helps ensure that the roof stays on the structure, and the structure stays anchored on its foundation. Experience in high wind events has shown that once the roof begins to peel away from the walls, or the building begins to move off its foundation due to extreme lateral wind forces, major structural damage occurs. If the damage continues unabated, the building can end up being a total loss.

The Emergency Management Division, Michigan Department of State Police (EMD/MSP), and the Michigan State Housing Development Authority (MSHDA), have begun a small pilot program aimed at employing wind engineering techniques on new residential construction. This initiative is designed to show that implementing such techniques can be a relatively inexpensive way to protect buildings from damage in high wind events. While these techniques will do nothing to protect a building from damage caused by flying debris, they will help ensure that the damage does not occur from the building coming apart at critical junctures due to extreme wind forces. If this pilot program is successful, it may be expanded in the future to include retrofitting existing residential and commercial structures.

The EMD/MSP is also involved in another pilot wind engineering research program with Michigan Technological University (MTU) to design composite shear walls and test them for their effectiveness at resisting high wind loads. Under this program, the university will design, analyze, construct and test four composite wall design and then publicize the findings on the Internet so that homeowners, building professionals and other interested parties can review and download the information. Recommendations will also be made to the American Society of Civil Engineers (ASCE) based on the program outcome and peer review of the results of the project. The MTU research program compliments and builds on studies completed by FEMA and the Building Research Council of the School of Architecture at the University of Illinois at Urbana-Champaign regarding structural connections in light wood frame construction. The MTU shear wall design may subsequently be used in construction projects in Michigan and throughout the country to mitigate damage from severe winds.

### Urban Forestry/Tree Maintenance Programs

Urban forestry programs can be highly effective in minimizing storm damage caused by falling trees or tree branches. In almost every severe wind event, falling trees and branches cause power outages and clog public roadways with debris. However, an intelligently designed, managed and implemented urban forestry program can help keep tree-related damage and impact to a minimum. To be most effective, an urban forestry program should address tree planting and maintenance in a comprehensive manner, from proper tree selection to proper placement, to proper tree trimming and long-term care.

Every power company in Michigan has a tree trimming program, and numerous local communities have some type of tree maintenance program. The electrical utility tree trimming programs are aimed at preventing encroachment of trees and tree limbs within power line rights-of-way. Typically, professional tree management companies and utility work crews perform the trimming operations. At the local government level, only a handful of Michigan communities have actual urban forestry departments or agencies. Crews from the public works agency or county road commission perform the bulk of the tree trimming work.

When proper pruning methods are employed, and when the work is done on a regular basis with the aim of reducing potential storm-related damage, these programs can be quite effective. Often, however, tree trimming work is deferred when budgets get tight or other work is deemed a higher priority. When that occurs, the problem usually manifests itself later in greater storm-related damage and tree debris management problems.

### Severe Winds Overview

Figures from the National Weather Service indicate that severe winds occur more frequently in the southern half of the Lower Peninsula than any other area in the State. On an average, severe wind events can be expected 3-4 times per year in the northern Lower Peninsula. These figures refer to winds from thunderstorms and other forms of severe weather, not tornadoes.

National Weather Service forecasts of severe winds usually gives sufficient warning time to allow residents to take appropriate action to reduce, at least to some degree, the effects of wind on structures and property. This allows residents some time to gather outdoor furniture, lawn ornaments, etc. indoors to prevent them from becoming flying debris and causing further property damage. However, when these events occur during the night, or incredibly early in the morning when people most likely are not listening to their television or radios, both damage and injury can be more severe. Also, as indicated earlier, proper structural bracing techniques can help minimize or even eliminate major damage due to the loss of the roof or movement of the building off its foundation.

In terms of response to a severe wind event, providing for the mass care and sheltering of residents left without heat or electricity, and mobilizing sufficient resources to clear and dispose of downed tree limbs and other debris from roadways, are the primary challenges facing Michigan communities. In addition, downed power lines present a public safety threat that requires close coordination of response efforts between local agencies and utility companies. Severe winds can affect every Michigan community. Therefore, every community should adequately plan and prepare for this type of emergency. That planning and preparedness effort should include the identification of necessary resources such as cots, blankets, food supplies, generators, and debris removal equipment and services. In Arenac County, the local chapter of the American Red Cross would be called. Depending on the severity and location of the disaster, the Red Cross will establish a shelter in pre-approved sites.

In addition, each community should develop debris management procedures (including the identification of multiple debris storage, processing and disposal sites) so that the stream of tree and construction debris can be handled in the most expedient, efficient, and environmentally safe manner possible. Both FEMA and the Michigan Department of State Police Emergency Management Division offer debris management courses to provide local, State, and Federal management personnel at all levels with an overview of issues and recommended actions necessary to plan for, respond to, and recover from a major debris generating event. These courses are useful for local government leaders in developing debris management plans.

To mitigate against the effects of severe winds, communities can: 1) institute a comprehensive urban forestry program; 2) properly brace and strengthen vulnerable public facilities; 3) ensure compliance with manufactured home anchoring regulations; 4) Coordinate with utility companies on local restoration priorities and procedures; 5) improve local warning systems; and 6) amend local codes to require structural bracing, where appropriate, in remodeled old structures and in all new residential and commercial construction.

## **Tornadoes**

A violently whirling column of air extending downward to the ground from a cumulonimbus cloud.

### **Hazard Description**

Tornadoes in Michigan are most frequent in spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce tornadoes. A tornado may have winds up to 300 miles per hour and an interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles but tracks up to 200 miles have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in tremendous loss of life, with a national average of 111 deaths per year. Property damage from tornadoes is in the hundreds of millions of dollars every year in the United States.

### **Tornado Intensity**

Tornado intensity is measured on the Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures. The Fujita Scale rates the intensity of a tornado based on damage caused, not by its size. It is important to remember that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be weak, and small tornadoes can be extremely strong. It is exceedingly difficult to judge the intensity and power of a tornado while it is occurring. Generally, that can only be done after the tornado has passed (see following page for scale.)

### **Recent Tornado Events in Arenac County**

There were two tornadoes identified in Arenac County in August of 2018:

1. Location: 2.25 miles south of Au Gres  
Date: 8/28/18  
Time: 9:14 PM-9:16 PM  
Rating: EF-1  
Comment: Near Point Au Gres Campground Dozens of mature hardwoods were snapped and uprooted.
2. Location: 3.75 miles northeast of Sterling  
Date: 8/28/18  
Time: 8:58 PM-9:00 PM  
Rating: EF-0  
Comment: Damage mainly to hardwood and softwood trees along the Rifle River.

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Arenac Co.	7/4/1977	2015	Tornado	F2	0	1	250,000	0
Arenac Co.	7/8/1977	1110	Tornado	F1	0	1	25,000	0
Arenac Co.	4/24/1993	1822	Tornado	F2	0	3	50,000	0
Alger	7/13/1995	1615	Tornado	F2	0	0	0	0
Au Gres	7/2/1997	1515	Tornado	F1	0	1	0	0
Alger	5/12/2000	1538	Tornado	F0	0	0	0	0
Standish	7/9/2007	1515	Tornado	EF0	0	0	15,000	1,000
<b>TOTALS</b>					<b>0</b>	<b>6</b>	<b>340,000</b>	<b>1,000</b>

Table 26 - Source: National Climatic Data Center

Tornadoes occur infrequently in Arenac County, usually decades apart, but as in 1993-1997, they occurred every other year. They have occurred from north to south and west to east in the county. They show no pattern of magnitude nor property damage. There have been no reported deaths and few injuries caused by the tornadoes.

Enhanced Fujita Scale damage and windspeed estimates						
Damage	Little Damage	Minor Damage	Roof Gone	Walls Collapse	Blown Down	Blown Away
EF5	X	X	X	X	X	X
EF4	X	X	X	X	X	
EF3	X	X	X	X		
EF2	X	X	X			
EF1	X	X				
EF0	X					
Estimated windspeed (mph)	65-85	86-110	111-135	136-165	166-200	200+

Figure 54: The Fujita Scale of Tornado Intensity

Note: When describing tornadoes, meteorologists often classify the storms as follows: F0 and F1- weak tornado; F2 and F3-strong tornado; F4 and F5 – violent tornado. The new enhanced Fujita Scale introduced on February 1, 2007 continues using F0-F5 ratings but is enhanced (E) based on additional calculations of wind and damage.

Existing Prevention Programs

Many of the programs and initiatives designed to mitigate against, prepare for, respond to, and recover from severe winds have the dual purpose of also protecting against tornadoes. As a result, there is some overlap in the narrative programs and initiatives descriptions for each respective hazard.

### National Weather Service Doppler Radar

Doppler Weather Surveillance Radar can assist in the detection of severe weather events that threaten life and property, including tornadoes and the severe storms that spawn them. With this technology, the lead time and specificity of warnings for severe weather have improved significantly over previous methods of weather detection. Doppler technology calculates both the speed and the direction of motion of severe storms. By providing data on wind patterns within developing storms, this new system helps forecasters identify the conditions leading to severe weather such as tornadoes. This means early detection of the precursors to severe storms, as well as information on the direction and speed of storms once they form.

### National Weather Service Watches/Warnings

The National Weather Service (NWS) issues tornado watches when the meteorological conditions are conducive to the development of a tornado. People in the watch area are instructed to stay tuned to local radio or television stations for weather updates and watch for developing storms. Once a tornado has been sighted and its existence is confirmed, or Doppler Radar shows strong probability of the development or occurrence of a tornado, the NWS will issue a tornado warning. The warning will identify where the tornado was sighted, the direction in which it is moving, and the time frame during which the tornado is expected to be in the area. People in the warning area are instructed to seek shelter immediately.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio, and the Emergency Management Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The NWS stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The NWS also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).

### Public Warning Systems

Numerous communities in Michigan have outdoor warning siren systems in place to warn the public about impending tornadoes and other hazards. Most of these systems were originally purchased as civil defense sirens to warn residents of a nuclear attack, but that purpose was later expanded to include severe weather hazards. These systems can be amazingly effective at saving lives in densely populated areas where the siren warning tone is most audible. In more sparsely populated areas where warning sirens are not as effective, communities are turning to NOAA weather alert warning systems to supplement or supplant outdoor warning siren systems. Unfortunately, many communities across the state, including parts of Arenac County, do not have adequate public warning systems in place to warn their residents of severe weather condition or other hazardous events. Federal funding specifically allocated to assist communities in the purchase of public warning systems has effectively disappeared, leaving many communities unable to purchase adequate systems to

warn their residents of impending danger. Several communities in the County do not have warning sirens, nor do all areas of the County receive the NOAA weather radio transmission signal.

The State of Michigan has used federal Hazard Mitigation Grant Program (HMGP) funds to assist several communities in purchasing outdoor warning sirens, NOAA weather alert systems, or both. Communities were also encouraged to implement a warning education program as part of the project, to ensure that residents know what to do once they receive warning of an impending hazardous event. Because HMGP funds must be used to fund a wide variety of mitigation projects, the amount of funds available to fund warning systems is limited to a small percentage of the overall available grant funds allocated to the state. The HMGP funds are provided on a 75 percent federal, 25 percent local cost share. A Presidential Major Disaster Declaration is required to activate the HMGP funding. As a result, the funding stream may not always be available in the future. In addition, state mitigation priorities may change over time, putting public warning systems at a lower priority than other mitigation projects.

### Severe Weather Awareness Week

Each spring, the Department of State Police Emergency Management Division, in conjunction with the Michigan Severe Weather Awareness Committee, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on severe weather events such as tornadoes, thunderstorms, lightning, hail, high winds and flooding. The purpose of the tornado portion of this campaign is to inform the public about what tornadoes are, when tornadoes usually occur, what people should do if a tornado occurs, what community warning systems exist, and to provide other pertinent tornado-related information as appropriate. Informational materials are distributed to schools, hospitals, nursing homes, other interested community groups and facilities, and the general public. Special educational programs are often conducted during this week.

### Manufactured Home Anchoring

Manufactured homes are always vulnerable to tornado damage, but especially so if they are not properly anchored. As a result, a major national effort has been initiated to encourage structural anchoring, or “tie down”, of manufactured homes. The Michigan Manufactured Housing Commission Administrative Rules (R 125.1602, Subsection 5) require new manufactured home installations in floodplains to be structurally anchored to a foundation. Through this requirement, the possibility of damage from wind is also reduced, although this will not protect a manufactured home from a direct hit by a tornado, it certainly will help prevent rollovers in many high-wind situations. Unfortunately, structures outside designated floodplains do not have to comply with the anchoring provision, although many owners choose to comply voluntarily. It should be noted that local communities have the option of adopting an ordinance that requires anchoring of manufactured home installations located outside a designated floodplain. State anchoring system standards are outlined in Administrative Rules R 125.606 through R 125.1608.

### Electrical Infrastructure Reliability

One of the major problems associated with the severe winds from tornadoes and thunderstorms is the loss of electric power caused by trees falling on power lines. Michigan has had numerous widespread and severe electrical power outages caused by severe wind and other weather events.

Several of those outages have resulted in upwards of 500,000 electrical customers (roughly 5 percent of the State's population) being without power for several hours to several days at a time. Wind-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. Detroit Edison, Consumers Energy and other major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by tornadoes, severe straight-line winds, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution lines underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages. (See also Urban Forestry/Tree Maintenance Programs section).

#### Structural Bracing/Wind Engineering

One of the best ways to protect buildings from damage from severe winds associated with thunderstorms, tornadoes, or other high wind events is to install structural bracing and metal connectors (commonly called hurricane clips) at critical points of connection in the frame of the structure. Typically, this involves adding extra gable end bracing at each end of the structure, anchoring the roof rafters to the walls with metal connector straps, and properly anchoring the walls and sill plate to the foundation. This extra bracing helps ensure that the roof stays on the structure, and the structure stays anchored on its foundation. Experience in tornadoes and other high wind events has shown that once the roof begins to peel away from the walls, or the building begins to move off its foundation due to extreme lateral wind forces, major structural damage occurs. If the damage continues unabated; the building can end up being a total loss.

The Michigan State Housing Development Authority, with Hazard Mitigation Grant Program funding from the Michigan Department of State Police, Emergency Management Division, has begun a small pilot program aimed at employing wind engineering techniques on new residential construction. This initiative is designed to show that implementing such techniques can be a relatively inexpensive way to protect buildings from damage in high wind events. While these techniques will do nothing to protect a building from damage caused by flying debris, they will help ensure that the damage does not occur from the building coming apart at critical junctures due to extreme wind forces. If this pilot program is successful, it may be expanded in the future to include retrofitting existing residential and commercial structures.

The EMD/MSP is also involved in another pilot wind engineering research program with Michigan Technological University (MTU) to design composite shear walls and test them for their effectiveness at resisting high wind loads. Under this program, the university will design, analyze, construct and test four composite wall design and then publicize the findings on the Internet so that homeowners, building professionals and other interested parties can review and download the information. Recommendations will also be made to the American Society of Civil Engineers (ASCE) based on the program outcome and peer review of the results of the project. The MTU research program compliments and builds on studies completed by FEMA and the Building Research Council of the School of Architecture at the University of Illinois at Urbana-Champaign regarding structural connections in light wood frame construction. The MTU shear wall design may subsequently be used



in construction projects in Michigan and throughout the country to mitigate damage from severe winds.

### Urban Forestry/Tree Maintenance Programs

Urban forestry programs can be highly effective in minimizing storm damage caused by falling trees or tree branches. In almost every tornado or other severe wind event, falling trees and branches cause power outages and clog roadways with debris. However, a professionally designed, managed and implemented urban forestry program can help keep tree-related damage and impacts to a minimum. To be most effective, an urban forestry program should address tree maintenance in a comprehensive manner, from proper tree selection, to proper placement, to proper tree trimming and long-term care.

Every power company in Michigan has a tree trimming program in place, and numerous local communities have some type of tree maintenance program in place. The electrical utility tree trimming programs are aimed at preventing encroachment of trees and tree limbs within power line rights-of-way. Typically, professional tree management companies and utility work crews perform the trimming operations. At the local government level, only a handful of Michigan communities have actual urban forestry departments or agencies. Rather, crews from the public works agency or county road commission perform the bulk of the tree trimming work.

When proper pruning methods are employed, and when the work is done on a regular basis with the aim of reducing potential storm-related damage, these programs can be quite effective. Often, however, tree trimming work is deferred when budgets get tight or other work is deemed a higher priority. When that occurs, the problem usually manifests itself in greater storm-related tree debris management problems down the line. Although nothing will prevent tree damage from a direct tornado strike, a well-planned, well-managed urban forestry program can certainly reduce the scope and magnitude of the post-tornado tree debris problem.

### Tornadoes Overview

Michigan is located on the northeast fringe of the Midwest tornado belt. The lower frequency of tornadoes occurring in Michigan may be, in part, the result of the colder water of Lake Michigan during the spring and early summer months, a prime period of tornado activity. During a timeframe between 1950 -2016, Arenac County had a total of 7 tornadoes.

Like severe wind events, tornado disasters require that communities plan and prepare for the mass care of residents left without electrical power and the clearance of trees and other debris from roadways. These are two primary challenges that face all Michigan communities in such an event. The planning and preparedness effort should include the identification of mass care facilities and supplies. In Arenac County, the local chapter of the American Red Cross would be called to prepare shelters and meals.

In addition, each community should develop debris management procedures (including the identification of multiple debris storage, processing and disposal sites) so that the stream of tree and

construction debris can be handled in the most expedient, efficient, and environmentally safe manner possible. Both FEMA and the Michigan Department of State Police Emergency Management Division offer debris management courses to provide local, State, and Federal management personnel at all levels with an overview of issues and recommended action necessary to plan for, respond to, and recover from a major debris generating event. Such a course would be useful for local government leaders in developing a debris management plan.

Although tornadoes cannot be prevented or predicted until almost the last moment, their potential impact on the citizens of Arenac County can certainly be reduced with the appropriate forethought and preparation.

### **Severe Winter Weather Hazards**

#### **Ice/Sleet Storms**

A winter storm that generates sufficient quantities of ice or sleet that results in hazardous conditions or property damage.

#### **Hazard Description**

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is like hail only smaller and can be easily identified as frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

#### **Ice and Sleet Storms in Arenac County**

Locations that are not specified in the Location and County category are larger and on a bigger scale than Arenac County.

#### **Recent Extreme Winter Weather**

Extreme subzero temperatures and heavy snow fall with drifting. For several days, all county school districts cancelled classes, many roads impassable stranding residents, County and local government facilities closed, home healthcare providers, meals on wheels, and dial a ride transportation not available in many areas of the county.

**47 SNOW & ICE** event(s) were reported in **Arenac County, Michigan** between **01/09/1997** and **04/03/2016**.

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Arenac (Zone)	1/9/1997	1400	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	1/15/1997	1200	Winter Storm	N/A	0	0	0	0

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Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Arenac (Zone)	1/24/1997	2100	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	1/8/1998	800	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	1/14/1998	1600	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	12/11/2000	2000	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	12/17/2000	500	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	4/4/2003	300	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	1/22/2005	1600	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	2/5/2006	800	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	2/16/2006	1545	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	12/1/2007	1600	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	12/19/2008	700	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	12/9/2009	0	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	2/1/2011	2300	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	2/20/2011	1500	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	12/28/2015	1500	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	3/23/2016	1600	Winter Storm	N/A	0	0	0	0
Arenac (Zone)	2/24/2001	2030	Ice Storm	N/A	0	0	0	0
Arenac (Zone)	4/11/2013	1500	Ice Storm	N/A	0	0	50,000	0
Arenac (Zone)	2/13/2000	600	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	3/2/2002	0	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	1/14/2004	1500	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	1/27/2004	2000	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	2/23/2004	2000	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	11/24/2004	2130	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	1/6/2005	1130	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	2/20/2005	2030	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	12/15/2005	2000	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	1/21/2006	130	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	3/2/2006	700	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	12/15/2007	1600	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	12/28/2007	1400	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	12/8/2008	2100	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	1/17/2009	800	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	3/22/2011	1900	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	2/24/2012	100	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	2/7/2013	1400	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	2/17/2014	1700	Heavy Snow	N/A	0	0	0	0

## Arenac County Hazard Mitigation Plan 2021

Arenac (Zone)	4/3/2016	1100	Heavy Snow	N/A	0	0	0	0
Arenac (Zone)	1/16/1997	800	Blizzard	N/A	0	0	0	0
Arenac (Zone)	3/9/1998	600	Blizzard	N/A	0	0	0	0
Arenac (Zone)	1/2/1999	1400	Blizzard	N/A	0	0	0	0
Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Arenac (Zone)	2/2/2011	200	Blizzard	N/A	0	0	0	0
Arenac (Zone)	2/4/2007	100	Extreme Cold/Wind Chill	N/A	0	0	0	0
Arenac (Zone)	1/6/2014	2100	Extreme Cold/Wind Chill	N/A	0	0	0	0
Arenac (Zone)	2/14/2015	1800	Extreme Cold/Wind Chill	N/A	0	0	0	0
<b>TOTALS</b>					<b>0</b>	<b>0</b>	<b>50,000</b>	<b>0</b>

**Table 27** - Source: National Climatic Data Center

### National Weather Service Doppler Radar

The National Weather Service (NWS) has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property - including severe winter weather events such as ice and sleet storms. Most important, the lead time and specificity of warnings for severe weather have improved significantly.

### National Weather Service Watches/Warnings

Sufficient warning can do much to reduce the damage from ice and sleet storms by permitting people to prepare properly. The National Weather Service uses the terms “ice storm”, “freezing rain”, and “freezing drizzle”, to warn the public when a coating of ice is expected on the ground and on other exposed surfaces. The qualifying term “heavy” is used to indicate ice coating which, because of the extra weight of the ice, could cause significant damage to trees, overhead wires, and other exposed objects.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA), weather radio, and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).

### Winter Hazards Awareness Week

Each fall, the Emergency Management Division, Department of State Police, in conjunction with the Michigan Committee for Severe Weather Awareness, sponsors Winter Hazards Awareness Week. This annual public information and education campaign focuses on winter weather hazard events such as

snowstorms, blizzards, extreme cold, and ice and sleet storms. Informational materials on winter weather hazards and safety are disseminated to schools, hospitals, nursing homes, other interested community groups and facilities, and the general public. Arenac County has severe winter weather throughout the county almost every year. Storms, heavy snow and extreme cold are regular occurrences, though no deaths or injuries have been reported and rarely is their property damage.

### Electrical Infrastructure Reliability

One of the major problems associated with ice storms is the loss of electric power. Michigan has had numerous widespread and severe electrical power outages caused by ice storms, several of which have resulted in a power loss to 250,000 – 500,000 electrical customers for several hours to several days at a time. Ice-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. Detroit Edison, Consumers Energy and other major electric utility companies and cooperatives have active, ongoing programs to improve system reliability and protect facilities from damage by ice, severe winds, and other hazards. Typically, these programs focus on trimming tree to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution lines underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages.

### Urban Forestry/Tree Maintenance Programs

Urban forestry programs can be highly effective in minimizing ice storm damage caused by falling trees or tree branches. In almost every ice storm, falling trees and branches cause power outages and clog public roadways with debris. However, a professionally designed, managed and implemented urban forestry program can help keep tree-related damage and impact to a minimum. To be most effective, an urban forestry program should address tree maintenance in a comprehensive manner, from proper tree selection, to proper placement, to proper tree trimming and long-term care.

Every power company in Michigan has a tree trimming program, and numerous local communities have some type of tree maintenance program. The electrical utility tree trimming programs are aimed at preventing encroachment of trees and tree limbs within power line rights-of-way. Typically, professional tree management companies and utility work crews perform the trimming operations. At the local government level, only a handful of Michigan communities have actual urban forestry departments or agencies. Rather, crews from the public works agency or county road commission perform the bulk of the tree trimming work.

When proper pruning methods are employed, and when the work is done on a regular basis with the aim of reducing potential storm-related damage, these programs can be quite effective. Often, however, tree trimming work is deferred when budgets get tight or other work is deemed a higher priority. When that occurs, the problem usually manifests itself in greater storm-related tree debris management problems down the line.

### Ice and Sleet Storms Overview

One of the biggest problems with ice and sleet storms is loss of power. The weight of the ice causes power lines to snap and break. Sometimes it can take days to restore power. If this happens temporary shelters may need to be set up. The local chapter of the American Red Cross would be called. Also, with

the power loss would come loss of heat, which could cause death from hypothermia especially with the elderly population. Another problem caused by ice and sleet storms would be debris cleanup. The weight of the ice could cause tree limbs to snap and break.

Approximately 87% of ice storms occur during the months of January, February, March and April, when conditions are most conducive for the development of ice and sleet. By listening for winter storm watches and warnings, people can be better prepared and lessen the impact of this hazard. The best way to avoid any consequences from an ice storm would be to stay inside and not travel unless necessary.

### Snowstorms

A period of rapid accumulations of snow, often accompanied by high winds, cold temperatures, and low visibility.

### Hazard Description

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation in Michigan ranges from 30 to 170 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan.

Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds (35+ miles per hour) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous.

The western Upper Peninsula experiences the most snowstorms in Michigan each year. The western half of the Lower Peninsula also experiences a relatively large number of snowstorms. One reason for this is the “lake effect”, a process by which cold winter air moving across Lake Michigan and Lake Superior picks up moisture from the warmer lake waters, resulting in significant snowfall amounts in the western part of the state.

### Snowstorms in Arenac County

(See events table above in Ice and Sleet Section)

### National Weather Service Doppler Radar

The National Weather Service has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property – including severe winter weather events such as snowstorms. Most important, the lead time and specificity of warnings for severe weather have improved significantly.

### National Weather Service Watches, Warnings and Advisories

The National Weather Service issues winter storm watches and winter weather warnings to notify the

public of severe winter weather conditions. A winter storm watch indicates severe winter weather

conditions (freezing rain, sleet, or heavy snow) may affect an area, while a winter weather warning indicates that severe winter weather conditions are imminent.

Winter storm warnings can be issued for snow alone, but they also can take on different varieties. For example, a blizzard warning signifies that blizzard conditions are imminent or occurring. Blizzard conditions mean that the visibility will frequently be one-quarter mile or less in falling or blowing snow with wind speeds at least 35 miles per hour. A wind chill warning is issued when wind chills drop below –50 degrees Fahrenheit with winds equal to or greater than 10 miles per hour. Finally, an ice storm warning is issued for a significant accumulation of ice, normally a coating of at least one-quarter inch.

The National Weather Service also issues several different advisories for winter weather. These advisories can be issued for snow, freezing rain, blowing snow, and wind chill, among other things. Advisories mean that conditions are expected to cause significant inconveniences and may be hazardous. However, if caution is exercised, the situation should not become life threatening.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio, and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).

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### Electrical Infrastructure Reliability

One of the major problems associated with any winter weather hazard (including snowstorms) is the loss of electric power. Although the problem is not quite as chronic in Michigan as it is with ice storms, snowstorms have nonetheless caused several widespread and severe electrical power outages. Weather-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. DTE, Consumers Energy and other major electric utility companies and cooperatives have active, ongoing programs to improve system reliability and protect facilities from damage by snow, ice, severe winds, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution lines underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages.

### Urban Forestry/Tree Maintenance Programs



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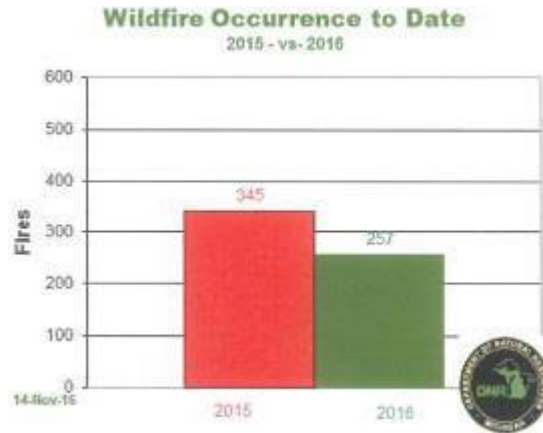
### Snowstorms Overview

Severe snowstorms can affect every Michigan community. Listening for the severe storm watches and warnings can lessen the impact of these storms. People should have adequate time to prepare for these storms by getting food, wood, fuel etc. into their homes. Another way to lessen the impact of the storm would be to stay off the roads unless it is necessary to travel.

Emergency service directors should have a plan in effect for mass care facilities, resources (such as cots, blankets, food, etc.), and snow removal. Severe snowstorms can cause power outages and block the roadways for several days at a time on some occasions. Thus, having a plan in affect would lessen this impact also.

### **Wildfire**

An uncontrolled fire in grass or brush lands, or forested areas.

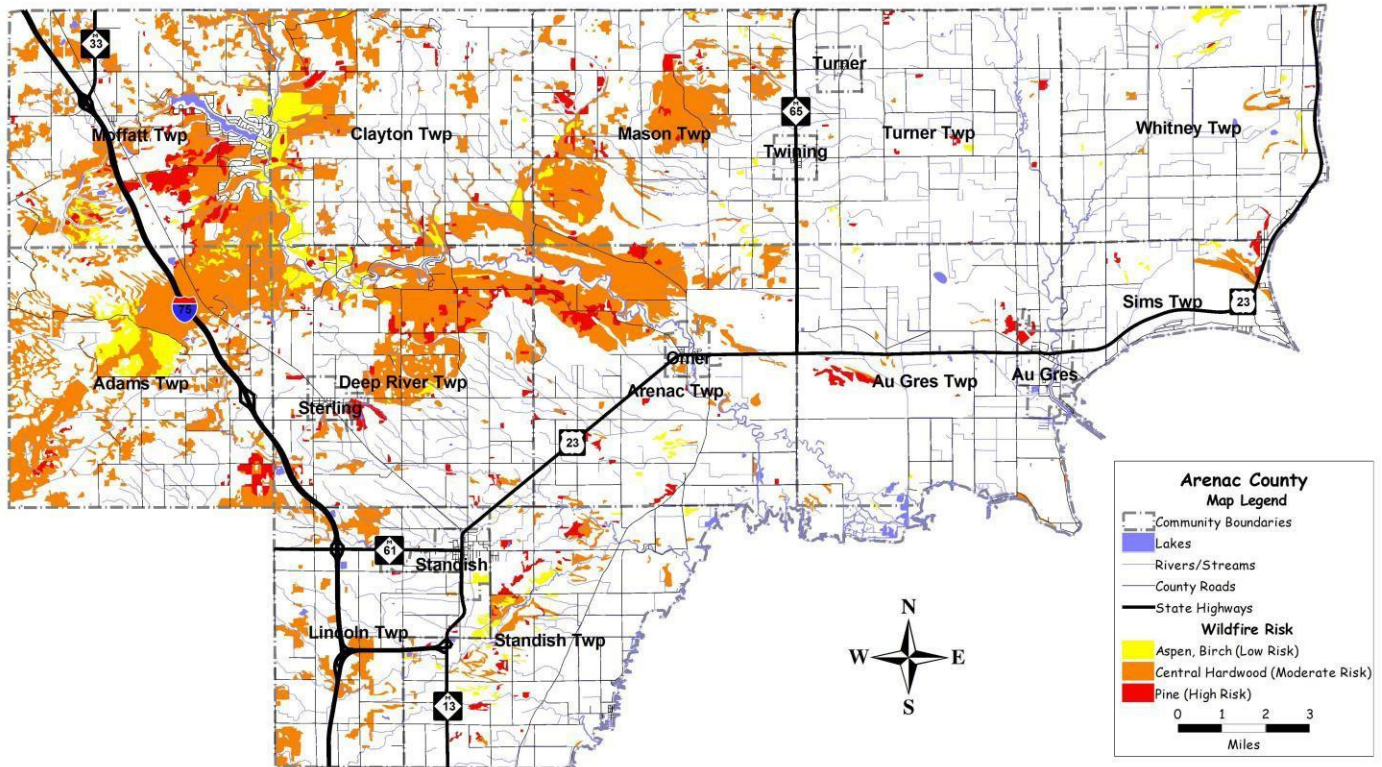


**Figure 55: Wildfire Occurrences 2015 - 2016**

### **Hazard Description**

Contrary to popular belief, lightning strikes are not a leading cause of wildfires in Michigan. Today, lightning causes only 2 percent of all wildfires, and the rest are caused by human activity. Outdoor burning is the leading cause of wildfires in Michigan. Debris burning was responsible for 32 percent of the wildfires in Michigan in 1999. Incendiary, or intentional, fires accounted for another 12 percent of the total wildfires.

Upon examination of the causes of fire, it becomes apparent that most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from uncontrolled wildfires is the destruction of timber, structures, other property, wildlife, and injury or loss of life to people who live in the affected area or who are using recreational facilities in the area.



**Figure 56: Arenac County Wildfire Risk Assessment Map**

Michigan Department of Natural Resources, Forest Management Division

The MDNR Forest Management Division directs and coordinates wildfire prevention, containment and suppression activities on all non-federal lands in the state, as well as Indian Reservations (under contract with the U.S. Bureau of Indian Affairs). The MDNR places great emphasis on wildfire prevention and public education, since most wildfires in Michigan are caused by human activity. The MDNR Forest Management Division’s philosophy is that preventing fires from starting in the first place and taking precautionary measures around rural homes to stop the spread of wildfires, are the best means of avoiding or minimizing wildfire losses. When conditions of extreme fire hazard exist, the MDNR can request that the Governor issue an outdoor burning ban to mitigate the potential for wildfire in all or part of the state. Such a ban restricts smoking, fireworks, and outdoor burning activities to approved locations.

Michigan Forest Fire Experiment Station

A string of disastrous wildfires in the early part of the 20<sup>th</sup> century led to the creation of the Michigan Forest Fire Experiment Station in 1929. This Station, established by the Michigan Department of Conservation (now Natural Resources) is designed to investigate how wildfires behave, how to responsibly manage forest fuels, and how to use mechanized equipment to fight wildfires. Its research efforts have been invaluable in helping to prevent, contain and suppress wildfires in Michigan and across the country.

### Michigan Interagency Wildland Fire Protection Association

Because most wildfires are caused by human activity, the Michigan Interagency Wildfire Prevention Group was established in 1981 by the Michigan Department of Natural Resources. This was the first such group in the nation promoting wildfire prevention and awareness that had 100 percent involvement of the State's fire agencies. By 1993, the Michigan Interagency Wildfire Prevention Group had expanded to form the Michigan Interagency Wildland Fire Protection Association (MIWFPA). The MIWFPA promotes interagency cooperation in fire prevention, training, fire technology, and firefighting operations. Members of the MIWFPA include:

1. MDNR Forest Management Division.
2. USDA Forest Service – Huron-Manistee, Hiawatha, and Ottawa National Forests.
3. USDI National Park Service - Pictured Rocks and Sleeping Bear Dunes National Lakeshores.
4. USDI Fish and Wildlife Service – Seney National Wildlife Refuge
5. USDI Bureau of Indian Affairs
6. Michigan Department of State Police, Fire Marshal Division
7. Michigan State Firemen's Association
8. Michigan Fire Chiefs' Association.

### Michigan Natural Resources and Environmental Protection Act

The Michigan Natural Resources and Environmental Protection Act (451 P.A. 1994), Part 515, assigns responsibility for the prevention and suppression of forest fires to the Director of the Michigan Department of Natural Resources. The Act also establishes requirements for burning permits, allows the Governor to issue prohibitions against the use of fire during extreme fire hazard conditions, and allows the DNR Director to enter into forest fire assistance agreements with other states and the federal government to control forest fires. These measures contribute to forest fire mitigation by preventing forest fires from starting in the first place or lessening the spread of fires when they do start.

### Solid Waste Management Act

The Michigan Solid Waste Management Act (264 P.A. 1990) prohibits the burning of leaves and grass clippings in municipalities over 7,500 in population, unless a municipality has an ordinance expressly allowing such burning activities. When properly applied, and enforced, this law helps prevent some wildfires, since over one-quarter of all wildfires are started by small residential waste fires that get out of control.

### Great Lakes Forest Fire Compact

The DNR Forest Management Division is a member of the Great Lakes Forest Fire Compact. The Compact is a partnership between the states of Michigan, Wisconsin and Minnesota, and the

Canadian provinces of Ontario and Manitoba. Its purpose is to promote effective prevention, pre-suppression, and control of wildfires in the Great Lakes region through mutual aid and cooperation. Initiatives are implemented by committees comprised of members of the Compact. An example of an activity the Compact has undertaken is the development of a fire hazard assessment for the region. Michigan took the lead on this project, and it has proven to be an extremely beneficial educational tool for communities and property owners in assessing their fire hazard potentials.

The efforts of the Compact to build coordination and cooperation are based on the understanding that wildfires are multi-jurisdictional, and that suppression of fires usually requires the efforts of many groups and jurisdictions.

### “Firewise Communities” Wildfire Protection Program

The MDNR is a participant in the national “Firewise Communities” Program developed by the National Wildland/Urban Interface (WUI) Fire Protection Program. The WUI Fire Protection Program is sponsored by the nation’s major wildland fire agencies and the National Fire Protection Association (NFPA). In addition to the NFPA, other sponsors include: 1) USDA Forest Service; 2) USDI; 3) USDI National Park Service; 4) USDI Bureau of Land Management; 5) USDI Bureau of Indian Affairs; 6) USDI U.S. Fish and Wildlife Service; and 7) National Association of State Foresters. These member agencies have been promoting “Firewise” living since 1986.

The Firewise Communities Program is designed to educate governmental officials and professionals in a wide variety of disciplines (i.e., planners, builders, engineers, architects, bankers, insurance representatives, emergency managers, land managers) on ways in which communities can be designed and built to minimize the threat from wildfires. The current focus of that educational effort is a series of Firewise Communities Workshops being held around the country. At the workshops, participants use computerized mapping and wildfire simulations to learn how to recognize wildland/urban interface fire hazards, design Firewise homes and landscapes, deliver fire education, and integrate Firewise planning into existing and developing areas of communities. The Firewise Communities Program also produces and distributes guidance documents, videos, and software packages on wildland/urban interface fire issues.

The Firewise Program is being implemented locally in selected pilot communities across the country. The City of Grayling was selected by the MDNR as the Michigan’s first Firewise pilot community. If the program proves successful, additional communities will be selected for program implementation soon.

### National Fire Incident Reporting System

The National Fire Incident Reporting System (NFIRS) was established by the National Fire Data Center in order to carry out the intentions of the Federal Fire Prevention and Control Act of 1974(P.L. 93- 498). This Act authorizes the National Fire Data Center of the United States Fire Administration (USFA) to gather and analyze national information on fires. The Act further authorizes the USFA to develop uniform data reporting methods, and to encourage and assist state agencies in developing and reporting data.

The most recent version of NFIRS, version 5.0, was released in January 1999. This software has been designed as a tool for fire departments to report and maintain computerized records of fires and other fire department incidents in a uniform manner. Not only does NFIRS 5.0 help State and local government develop fire reporting and analysis capability for their own use, and to obtain data that can be used to assess more accurately and subsequently to combat the fire problem at a national level, it expands the collection of data beyond fires to include the full range of fire department activity on a national scale. It is a true all-incident reporting system.

As of January 1, 1999, Michigan required that all fire incidents be reported with NFIRS 5.0. This includes those fires suppressed by both the DNR and local fire departments.

### **Infrastructure Failures**

A failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions or services.

#### **Hazard Description**

Michigan's citizens are dependent on the public and private utility infrastructure to provide essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems, fail due to disaster or other cause – even for a short period of time – it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes if immediate mitigative action is not taken. When the water or waste treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur.

These are just some examples of the types of infrastructure failures that can occur, and all these situations can lead to disastrous public health and safety consequences if immediate mitigative actions are not taken. Typically, it is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) that are the most actively affected by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and possibly even regions can be severely affected. Cyber security is the greatest area of vulnerability for all of the Critical Infrastructure; there have been several very costly attacks on not only Electrical Grids but Oil pipelines.

#### **State and Federally Assisted Infrastructure Mitigation Projects**

The State of Michigan has been very pro-active in its mitigation efforts for public infrastructure. Since 1994 the state has partnered with 26 Michigan local governments to allocate over \$31 million in federal Hazard Mitigation Grant Program (HMGP) and local funds (a 25% local match) to address vulnerabilities in water, sewer, storm drainage, telecommunications, radio communications, and highway transportation infrastructure. Cyber and Infrastructure Security Agency (CISA) is responsible for all Infrastructure and Cyber security issues in the US. They have several programs to assist Critical Infrastructure stakeholders with protecting their sectors.

### Water Distribution Systems

Michigan's public water supplies are regulated under the Federal Safe Drinking Water Act. The Michigan Department of Environmental Quality (MDEQ), as a primary agency for the Federal government, provides supervision and control of Michigan's public water supplies (including their operation and physical improvements) under the Michigan Safe Drinking Water Act (399 P.A. 1976). The MDEQ Drinking Water and Radiological Protection Division regulates, through a permit process, the design, construction and alteration of public water supply systems. Water supply construction must be conducted within the framework of the Michigan Safe Drinking Water Act, as well as the Architecture, Professional Engineering and Land Surveying Act (240 P.A. 1937), which requires professional engineering preparation of construction documents for water works construction costing over \$15,000. Most communities in Michigan have, in conjunction with the MDEQ, developed water system master plans that conform to the requirements of the Michigan Safe Drinking Water Act. From a hazard mitigation standpoint, that is important because it helps ensure that all new water system construction and alterations to existing systems will conform to the minimum standards set in the act. While not making water infrastructure "disaster-proof", the standards provide at least a basic level of design, structural and operational integrity to new or renovated portions of a community's water supply system.

### Wastewater Collection/Treatment Systems

The Federal Clean Water Act regulates the discharge from community wastewater collection and treatment systems. The regulatory aspects of the Act that pertain to municipalities have been delegated to the MDEQ Surface Water Quality Division for surface water discharge facilities, and the MDEQ Waste Management Division for groundwater discharge facilities. Authority for the oversight of planning, facility design review, and construction permitting of sewerage systems collection, transportation and treatment facilities, is derived from Part 41 of the Michigan Natural Resources and Environmental Protection Act (451 P.A. 1994) and Administrative Rules promulgated under authority of Part 41. The two MDEQ divisions assist communities with the development and maintenance of their wastewater collection and treatment systems. In addition, they monitor and regulate these systems to ensure pollution abatement and health conditions are met. Although the regulatory authority vested in the MDEQ is primarily aimed at preventing pollution of waters of the state, there are requirements in place under 451 P.A. 1994 regarding the design, construction, and operational integrity and reliability of wastewater collection and treatment systems.

The U.S. Environmental Protection Agency's (EPA) Technology Transfer Program, the "Recommended Standards for Sewage Works" developed by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers, and other technical references provide important technical information to MDEQ personnel about the design and operation of wastewater collection and treatment system components. This information is used extensively by the MDEQ to review designs and operation procedures for the municipal wastewater program. Included within this guidance are basic minimum standards that help ensure an adequate level of structural and operational integrity for wastewater systems.

### Surface Drainage Systems

Michigan's first drainage laws appeared on the books as Territorial laws years before Michigan achieved statehood. After attaining statehood in 1837, the State passed its first drain law in 1839. Since that time, there have been 45 separate acts passed regarding drainage, up to the most recent recodification of drain law in 1956. Since 1956, the present drain code has been amended over 200 times – an indication of how important and dynamic the issue of drainage continues to be in Michigan.

The Michigan Drain Code provides for the maintenance and improvement of the vast system of intra-county and inter-county drainage facilities. Each drain has a corresponding special assessment district (watershed), a defined route and course, and established length, and is conferred the status of a public corporation with powers of taxation, condemnation, ability to contract, hold, manage and dispose of property, and to sue and be sued. Drainage districts and drains are established by petition of the affected landowners or municipalities. County drains, with a special assessment district entirely within the county, are administered by the locally elected County Drain Commissioner. Inter-county drains, with a special assessment district in more than one county, are administered by a drainage board that consists of the drain commissioners of the affected counties and is chaired by the Director of the Michigan Department of Agriculture (MDA) or an MDA Deputy Director.

The intra-county and inter-county drainage program, administered by county drain commissioners and the MDA operates, maintains, and improves water conveyance and treatment systems ranging from small agricultural drains to urban storm drains or sanitary drains. (Note: Some drains are constructed of pipes that range in size from 12 inches in diameter to over 16 feet in diameter, with massive pumping stations carrying storm or sanitary sewage which serve thousands of residents. Other drains are open channels or ditches that vary from several feet in width and dry during part of the year, to large river channels in excess of 100 feet in width. Flood water retarding dams, flood pumps, erosion control structures, storage basins and wastewater treatment structures are also part of the infrastructure constructed under the Michigan Drain Code.) Statewide, there are over 18,000 established drainage districts with an estimated combined length of over 40,000 miles of channel. These facilities vary from rural agricultural open channels with drainage areas of several hundred acres to large river systems with drainage areas of several hundred square miles.

As Michigan's villages, towns and cities have grown, the drains that were designed to serve primarily agriculture have also been used to carry storm water from municipalities and subdivisions, as well as



serve as outlets for sanitary treatment plants and a variety of other permitted discharges. Operation, maintenance, and improvement of drains in suburban and urban areas now provides for the management of storm water, combined sanitary overflows, and sanitary sewage collection and treatment. Increasing demands on the drainage system in many areas of the State requires that continuous improvements be made to enhance drain capacity and flow characteristics, reduce sedimentation, and improve structural integrity.

The Michigan Drain Code allows for landowners or municipalities to petition for maintenance or improvement of the drainage systems. Drain commissioners or drainage boards, in the absence of a petition, can maintain the drainage systems but are limited by law in the amount of money they are allowed to expend. The maintenance limit is equal to \$2,500 per mile of established drain. This amount is generally sufficient for ordinary operation and maintenance, but it is inadequate during times of widespread damage such as happens during a disaster. Because drainage districts stand on their own, money or the maintenance limit cannot be shared between districts. This greatly limits flexibility and can severely constrict drain reconstruction, improvement, and damage mitigation efforts in a post-disaster setting.

Efforts are underway to amend the Michigan Drain Code to address more adequately current and anticipated future problems and concerns, and to make it more applicable to modern development circumstances.

### Electrical System

Disaster-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. DTE, Consumers Energy and other major electric utility cooperatives and companies have active, ongoing programs to improve system reliability and protect facilities from damage by wind, snow and ice, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution systems underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages.

### Telecommunications System

Like electric utility companies, telecommunications companies are concerned with the issue of protecting facilities and systems from disaster-related damage. Major telecommunications companies have programs to improve system reliability and physically protect facilities and system components from wind, snow and ice, and other hazards, utilizing many of the same techniques as the electric utility companies.

### Infrastructure Failures Overview

Most of Arenac County's infrastructure failures are secondary events caused by other major events such as floods, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are usually restored in a matter of hours. However, if the power were out for a longer period, the local chapter of the American Red Cross would be called to set up temporary shelters.

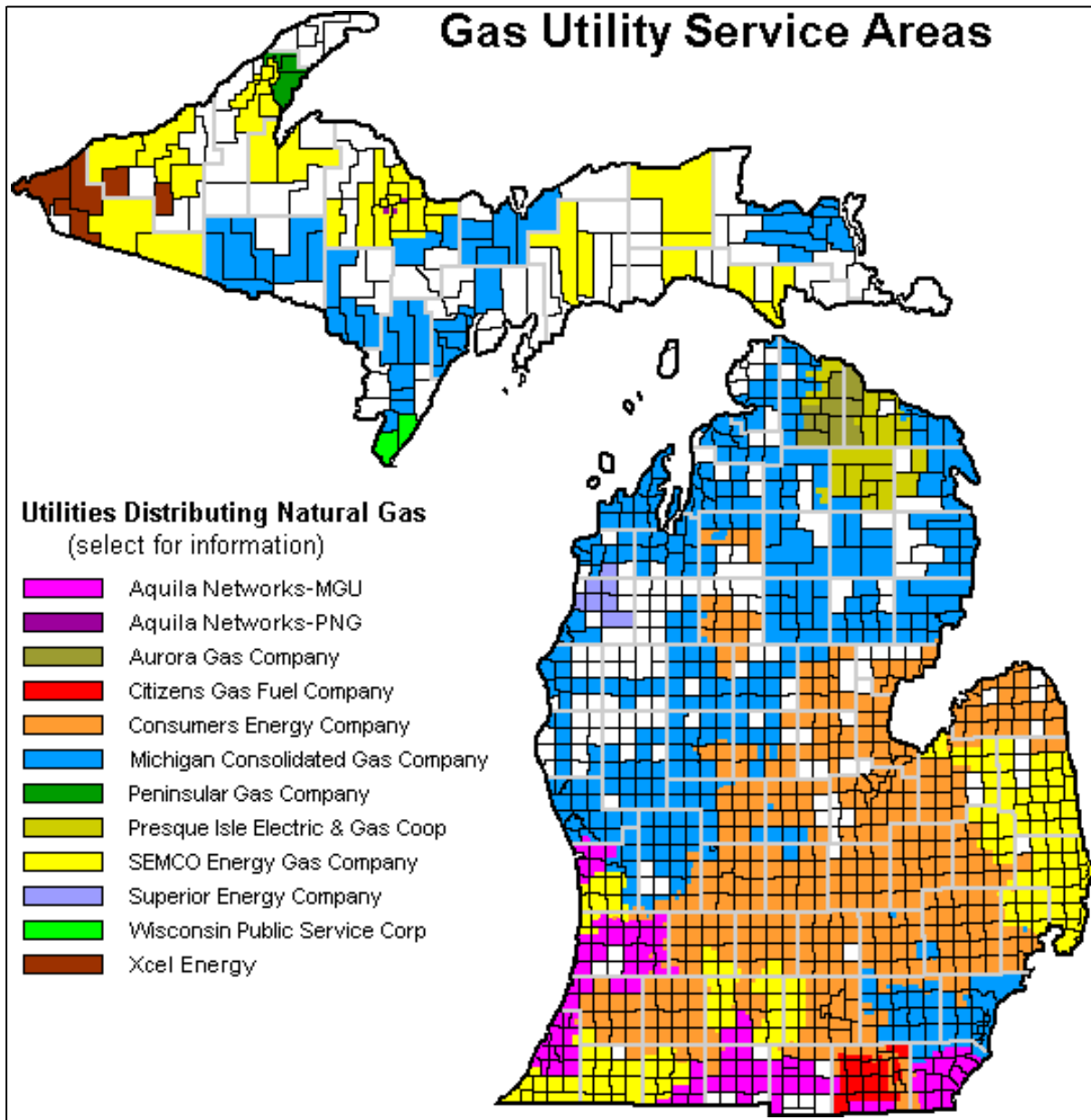


Figure 57: Utilities Distributing Natural Gas Map

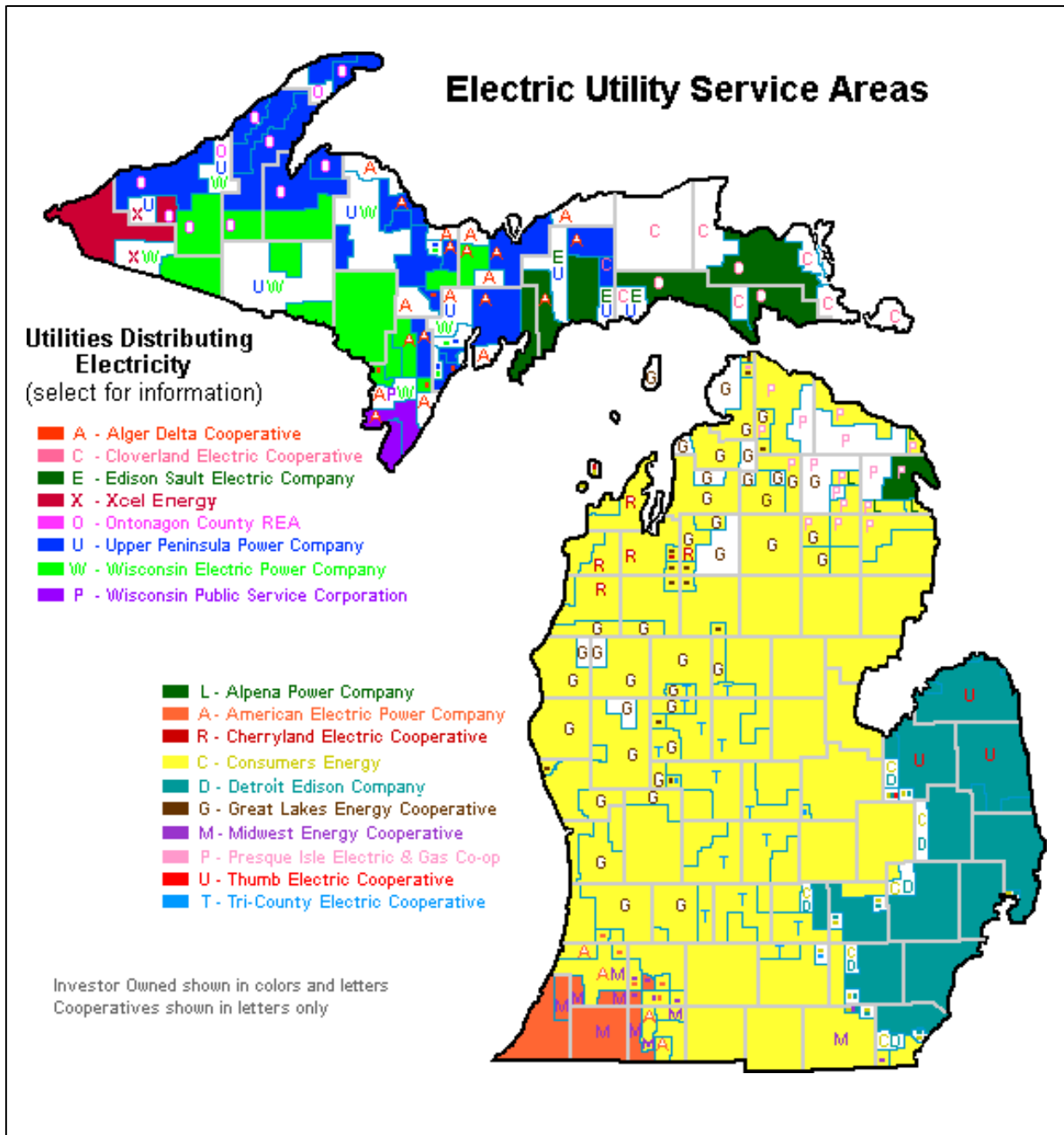


Figure 58: Utilities Distributing Electricity Map

## **Hazardous Material Incidents - Transportation**

An uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment.

### **Hazard Description**

As a result of the extensive use of chemicals in our society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments daily through communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people.

Michigan has had numerous hazardous material transportation incidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Those types of incidents, while problematic for the affected community, are commonplace. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Larger incidents, however, pose a whole new set of problems and concerns for the affected community. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life safety and health and well-being of those in the immediate vicinity of the accident site, as well as those who encounter the spill or airborne plume. In addition, damage to property and the environment can be severe as well. Statistics show almost all hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure of the carrying vessel.

### **Federal Hazardous Material Transportation Regulations**

The transportation, manufacturing, storage, and disposal processes for hazardous materials are highly regulated by federal and state agencies in order to reduce risk to the general public. At the federal level, the U.S. Department of Transportation, Office of Hazardous Materials Safety (USDOT/OHMS), is the regulating agency for all modes of hazardous material transportation. In addition to enforcing federal hazardous material transportation regulations, the USDOT/OHMS is also involved in several other areas aimed at improving the safety of hazardous material shipping. Those areas include:

1. Research and development of improved containment/packaging and other technological aspects of hazardous material shipping.
2. Interagency coordination efforts in hazardous material transportation planning and standards setting.
3. Management of data information systems pertaining to hazardous material transportation.
4. Development of hazardous material safety training policies and programs.

The USDOT regulations specify the type and size of container that can be utilized for shipping each hazardous material, the label that must be on the container, the placards that must be shown on the carrying vessel, how much of the material can be shipped in one vessel, and in some cases, how the contents should be organized or loaded. Many hazardous materials are assigned a unique four-digit identification number that is located on the placard or container. In addition, the regulations also require a company involved with hazardous material transport to maintain a manifest, which details

what material is being transported and its quantity, a list of emergency contact numbers in case of an uncontrolled release, where the material is from, and its intended destination.

In Michigan, the Motor Carrier Division, Department of State Police, oversees, coordinates and implements the commercial truck safety aspects of the USDOT regulations. The Michigan Department of Transportation oversees programs aimed at enhancing railroad safety and improving the rail infrastructure (which helps reduce the likelihood of a hazardous material rail transportation accident).

### Hazardous Materials Transportation Uniform Safety Act

The Federal Hazardous Materials Transportation Uniform Safety Act (HMTUSA), enacted in 1990, provides funding for the training of emergency responders and the development of emergency response plans for both fixed-site facilities and transportation-related incidents. (This funding mechanism under the HMTUSA is referred to as Hazardous Material Emergency Preparedness Grant [HMEP] grants.) In Michigan, the HMTUSA/HMEP program is coordinated and implemented by the Emergency Management Division, Department of State Police. Since the program's inception, over \$326,000 in grants have been allocated to 80 Michigan communities for hazardous material planning and training activities.

### Transportation Community Awareness and Emergency Response

Many industry groups are involved in an outreach program, coordinated by the Chemical Manufacturers association, called Transportation Community Awareness and Emergency Response (TRANSCAER). This program is a nationwide community outreach program that addresses community concerns about the transportation of hazardous materials through planning and cooperation. The program provides assistance to communities to develop and evaluate their emergency response plans for hazardous material transportation incidents. In Michigan, TRANSCAER activities and initiatives are coordinated by the Michigan Chemical Council.

### Hazardous Material Response Training

The Emergency Management Division, Department of State Police, provides a wide array of hazardous material response training programs through the Michigan Hazardous Material Training Center. The Center provides training courses for individuals and companies responsible for planning, inspection, response, mitigation, and cleanup activities involving hazardous materials. Specific subjects include:

1. Computer-aided management.
2. Hazardous material chemistry
3. Hazardous materials emergency response.
4. Hazardous waste worker compliance.
5. Incident management.
6. Hazardous materials monitoring/sampling.
7. Other specialized hazardous materials-related courses such as highway and rail cargo tanker handling, confined space entry, emergency medical services, and technical rescue.

Courses are conducted at the Center in Lansing and at various other locations throughout the state.

### Federal/State Hazardous Material Response Resources

There are numerous groups at the federal, state, and local levels, and in private industry that are trained to deal with hazardous material fixed site and transportation incidents. These groups include the National Response Team (NRT), Regional Response Teams (RRTs), and state and local hazardous material response teams. The Chemical Manufacturers Association established the Chemical Transportation Emergency Center (CHEMTREC) to provide 24-hour technical advice to emergency responders. The National Response Center (NRC), which operates much like CHEMTREC, was established to provide technical advice and coordinate federal response to a hazardous material incident.

In Michigan, a 24-hour statewide notification system called the Pollution Emergency Alerting System (PEAS) was established for reporting chemical spills to the Department of Environmental Quality. As a companion to the PEAS, the Michigan Department of Agriculture (MDA) has established a 24-hour Agriculture Pollution Emergency Hotline for use by agri-chemical users to report fertilizer and pesticide spills. Callers to the MDA hotline gain immediate access to appropriate technical assistance, regulatory guidance for remediation, and common-sense approaches for addressing the problem.

### U.S. EPA Chemical Emergency Preparedness and Prevention Office

The U.S. Environmental Protection Agency's Chemical Emergency Preparedness and Prevention Office (CEPPO) provides leadership, advocacy and assistance to states, local governments, and private industry to:

1. Prevent and prepare for chemical emergencies.
2. Respond to environmental crisis.
3. Inform the public about chemical hazards that may be present in their community.

The CEPPO works closely with several Michigan state agencies to implement and coordinate several regulatory and non-regulatory programs designed to protect human health and the environment in Michigan from chemical accidents.

### National Transportation Safety Board

The National Transportation Safety Board (NTSB) investigates all significant transportation accidents that occur in this country and issues safety recommendations to the transporter and government regulators aimed at preventing future accidents. (To date, four hazardous material transportation accidents in Michigan have resulted in an NTSB investigation. A fifth accident is currently under investigation.) The NTSB also publishes a list of "most wanted" safety improvements for all modes of transportation for nationwide implementation by appropriate entities. Although these safety improvement recommendations are not mandatory, and the NTSB has no regulatory or enforcement powers, it nonetheless has been successful in getting more than 80% of its recommendations adopted. Many safety features currently incorporated into the various hazardous material transportation vessels had their genesis in NTSB recommendations. The NTSB works directly with the USDOT on most hazardous material transportation accident issues.

### Michigan Chemical Council

The Michigan Chemical Council is the primary trade association representing the chemical and allied industries in Michigan. As such, it works in partnership with the national Chemical Manufacturers Association, the Emergency Management Division, Department of State Police, and other agencies and local governments to provide educational and community outreach services in the area of chemical awareness and safety. The Council provides an important informational and coordination bridge between Michigan's chemical industries, federal, state and local regulatory agencies, and the public.

### Chemical Awareness Week

Each spring, the Emergency Management Division, Department of State Police, in conjunction with several other state agencies, Local Emergency Planning Committees (LEPCs), and the Michigan Chemical Council, sponsors Chemical Awareness Week. This annual public information campaign focuses on:

1. The hazards associated with the manufacture, transport, storage, use and disposal of chemicals.
2. The programs and systems in place to protect the public from accidental chemical releases.
3. Community emergency response procedures for chemical accidents.

Informational materials on chemical hazards and safety are disseminated to schools, hospitals, nursing homes, other interested community groups and facilities, and the general public.

### Hazardous Material Incidents: Transportation Overview

There have been significant hazardous materials incidents and many minor petroleum and hazardous materials spills throughout the years in Arenac County. Most major highways within the county are two lanes or interstates. These routes are heavily traveled in the summer months and often icy or impassible in the winter. Unless wise policies are followed, a serious hazardous materials incident could occur on one of our roadways or railways. In October 2015, a significant hazardous material incident occurred in Whitney Township in Arenac County resulting in approximately 4,000 gallons of gasoline spilled, groundwater contamination, property damage, personal injury and ecological damage.

## **Structural Fires**

Any instance of uncontrolled burning which results in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas.

### Hazard Description

In terms of average annual loss of life and property, structural fires--often referred to as the "universal hazard" because they occur in virtually every community -- are by far the biggest hazard facing most communities in Michigan and across the United States. Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to some sources, structural fires cause more loss of life and property damage than all types of natural disasters combined. Direct property losses due to fire exceed \$9 billion per year.

Ironically, while the United States has made great strides in reducing deaths and injuries caused by other types of disasters, structural fires are a worse problem in this country than in many other industrialized countries (even those with a denser population pattern). The United States Centers for Disease Control (CDC) figures indicate that fire-associated mortality rates in the United States are approximately 2-3 times greater than those in many other developed countries.

Structural fires are a common occurrence in Arenac County. They are especially likely to happen in the winter when wood stoves and substandard heating implements are used or when extreme temperatures cause otherwise adequate heating units to be overtaxed. Standish and AuGres in Arenac County have downtown areas consisting of buildings built in the 19<sup>th</sup> century or early 20<sup>th</sup> century with zero lot lines which pose a significant threat.

### Existing Prevention Programs

All Arenac County Fire Departments provide extensive fire prevention training in schools and at public events, as well as partnering with the Red Cross to offer smoke alarms for all homes within Arenac County.

### Michigan Fire Prevention Act

The Michigan Fire Prevention Act (207 P.A. 1941), the State's primary fire enabling legislation, provides for the prevention of fires and the protection of persons and property from exposure to the dangers of fire and explosion. The Act gives the State Fire Marshal (Michigan Department of State Police) and local fire chief's broad authority to take actions necessary to prevent fires and stop the spread of fires once they have started. This includes:

1. Requiring the razing, repair, alteration or improvement of buildings and premises that constitute fire hazards.
2. Controlling the use and occupancy of such buildings and premises.
3. Engaging in public education activities aimed at preventing or mitigating the effects of fire and explosion.

### Michigan State Police, Fire Marshal Division

The Michigan Fire Fighters Training Council, housed within the Michigan State Police, performs a number of tasks aimed at developing, improving, and enhancing the training of fire fighters in Michigan. This includes, but is not limited to:

1. Developing standards for training and fire fighter selection
2. Establishing courses of study and instructor qualifications and certification.
3. Evaluating instructors and schools.
4. Assisting fire departments with training.

All these functions contribute to structural fire mitigation by enhancing the skills of fire fighters in preventing and suppressing fires.

The Fire Marshal Division, in conjunction with local fire departments, conducts several other important fire-related initiatives, including:

1. Statewide public education programs aimed at preventing fires.



2. Investigating fires, explosions and hazardous material incidents.
3. Collecting, compiling and analyzing fire-related data (through the Michigan Fire Incident Reporting System) to determine fire frequency, causes, and impacts.

### Michigan Department of Consumer and Industry Services, Office of Fire Safety

The Michigan Department of Consumer and Industry Services, Office of Fire Safety, is responsible for conducting fire safety and prevention inspections in state regulated facilities and certain other facilities. Specific services provided include:

1. Fire safety inspections of adult foster care, correctional and health care facilities, and hotels/motels.
2. Plan review and construction inspections of the regulated facilities in item 1, as well as schools, colleges, universities, and school dormitories.
3. Coordination of fire inspector training programs.
4. Coordination of fire alarm and fire suppression system installation in regulated facilities.
5. The State Fire Safety Board, also housed within the Michigan Department of Consumer and Industry Services, promulgates rules covering the construction, operation and maintenance of schools, dormitories, health care facilities, and correctional facilities. These rules are designed to protect life and property at these facilities from fire, smoke, hazardous materials and fire-related panic.

### National Fire Protection Association

Established in 1896, the National Fire Protection Association (NFPA) conducts research on fires and fire-related issues, develops codes and standards for fire prevention and protection, and disseminates fire safety information to fire departments and the public. The cornerstone of the NFPA's fire prevention activities is its consensus standards development system. The NFPA's consensus process involves over 5,000 volunteers from a wide range of professional backgrounds who serve on more than 200 technical committees, each reflecting a balance of affected interests. This consensus standards development system resulted in the creation of the National Fire Codes, 275 codes and standards covering all areas of fire safety. These codes are used throughout the world, and virtually every building and construction process in place today is affected, in one way or another, by the codes and standards developed through the NFPA system.

### U.S. Fire Administration

Established by P.L. 93-498, the Federal Fire Prevention and Control Act of 1974, the U.S. Fire Administration (USFA) provides leadership, coordination and support for the nation's fire prevention and control, fire training and education, and emergency medical services activities. The USFA, a branch of the Federal Emergency Management Agency, conducts training for firefighters through the National Fire Academy (NFA), located in Emmitsburg, Maryland. Many Michigan firefighters have attended those training courses. In addition, the USFA administers a number of national fire programs aimed at fire prevention, with a particular emphasis on structural fire prevention. The USFA also supports the National Fire Incident Reporting System (NFIRS), administered and implemented in Michigan by the State Police Fire Marshal Division. The NFIRS provides the vehicle for collecting and analyzing information on fire frequency and causes, as well as deaths, injuries and property losses associated with fires. Over 900 local fire departments in Michigan participate in the NFIRS. The NFIRS data is used by the Fire Marshal Division and other state and local fire agencies to assess and combat the fire

problem in Michigan.

#### Local Fire Service

Over 1,000 local fire departments and roughly 30-35,000 fire fighters constitute the bulk of Michigan's fire service forces. By and large, these local forces are either volunteers or paid part-time (approximately 50% paid part-time; 22% volunteer; 28% paid full-time). According to statistics from the State Police Fire Marshal Division, local fire departments in Michigan respond to a fire call, on average, every 1 ½ minutes, and to a structural fire call roughly every 26 minutes. In addition to fire suppression, local fire departments also conduct vitally important public education, code enforcement and fire investigation activities within their respective communities. Local fire departments are the lifeblood of Michigan's fire prevention and suppression system.

#### Fire Safety Rules for Michigan Dormitories

Even before the Seton Hall University dormitory fire in January 2000, the State Fire Safety Board within the Michigan Department of Consumer and Industry Services took action to enhance the fire and life safety protection of Michigan's college and university dormitories. On December 21, 1999 two new sets of rules took effect governing the construction, operation, and maintenance of school, college and university instructional facilities and dormitories. These sets of rules were updated to meet the most current nationally recognized standards from the National Fire Protection Association. The new rules adopted the 1997 edition of NFPA 101, Life Safety Code. NFPA standards provide the minimum requirements necessary to establish a reasonable level of fire and life safety and property protection from hazards created by fire and explosion.

The new rules require, among other things, that fire sprinklers be installed in newly constructed dormitories or those undergoing major renovation. However, existing dormitories don't fall under the new rules and therefore do not have to be retrofitted unless they are being renovated.

#### Nature and Composition of Michigan Fire Service

The primary challenge facing the Fire Marshal Division, in particular, and the State of Michigan, in general, is the nature and composition of the Michigan fire service. The high proportion of fire fighters that are either volunteer or paid part-time presents significant challenges to sustaining adequate code enforcement and inspection efforts. In addition, the relatively high level of turnover within this group places additional demands on state and local training resources.

The lack of full-time professional fire fighters in many areas of the state means less time is available to conduct fire inspections and take other preventive measures necessary to lessen the structural fire threat. In many small towns and rural communities, local efforts in fire prevention are almost non-existent due to lack of personnel and time to devote to such activities. Out of necessity, efforts in these communities are directed at fire suppression. Clearly, the lack of full-time paid fire professionals in many areas across the state poses great challenges for maintaining a sustainable fire prevention and inspection program.

#### Lack of State Fire Safety Code

The other major challenge facing the Michigan fire service is the lack of a state-mandated fire safety code and code enforcement program. Currently, Michigan is one of a small handful of states in the

country that does not have a mandated statewide fire safety code. Although the State enforces fire safety codes in schools, dormitories, health care facilities, and correctional facilities, plus some businesses, the remainder of the job is left to local officials. Because there is not a uniform, mandated fire safety code, numerous different local ordinances have been promulgated. In some communities, fire safety codes do not exist at all. This contributes to Michigan's structural fire problem by allowing serious fire safety violations to be created and to go unchecked, often for years. This problem manifests itself more seriously in rural areas and small towns, which typically have few, if any, paid full-time fire fighters. Michigan's larger cities have full-time fire departments with qualified inspectors. As a result, fire safety inspections are performed on a more regular basis (but not necessarily as often as they should be).

Even if mandated fire safety codes were instituted statewide, it wouldn't totally solve the problem of structural fire prevention because the costs of compliance in existing buildings would often be prohibitive for many business owners. Such a measure would, however, help see that new construction doesn't compound the problem.

### **Oil/Gas Well Incidents**

An uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide, from wells.

#### **Hazard Description**

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula. Since 1925, over 44,000 oil and natural gas wells have been drilled in Michigan, of which roughly half have produced oil and gas. To date, Michigan wells have produced approximately 1.4 billion barrels of crude oil and 4 trillion cubic feet of gas. There is a heavy concentration of wells in the Sterling Village area, mainly Turner, Adams, Deep River, and Clayton Townships.

The petroleum and natural gas industry are highly regulated and has a good safety record, but the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H<sub>2</sub>S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions. Over 1,300 wells in Michigan have been identified as having H<sub>2</sub>S levels exceeding 300 parts per million (ppm).

As the table below indicates, at concentrations of 700 ppm, as little as one breath of hydrogen sulfide can kill. Although hydrogen sulfide can be detected by a "rotten egg" odor in concentrations from .03 ppm to 150ppm, larger concentrations paralyze a person's olfactory nerves so that odor is no longer an indicator of the hazard. Within humans, small concentrations can cause coughing, nausea, severe headaches, irritation of mucous membranes, vertigo, and loss of consciousness. Hydrogen sulfide forms explosive mixtures with air at temperatures of 500 degrees Fahrenheit or above and is dangerously reactive with powerful oxidizing materials. Hydrogen sulfide can also cause the failure of high-strength steels and other metals. This requires that all company and government responders be familiar not only with emergency procedures for the well site, but also with the kinds of materials that are safe for use in sour gas well response.

Physiological Response to H<sub>2</sub>S

10ppm	Beginning eye irritation
50-100 ppm	Slight conjunctivitis and respiratory tract irritation after 1 hour exposure
100 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after 1 hour. Several hours of exposure results in gradual increase in severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after 1 hour of exposure.
500-700 ppm	Loss of consciousness and possibly death in 30 minutes to 1 hour.
700-1000 ppm	Rapid unconsciousness, cessation of respiration and death.
1000-2000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

**Table 28**

Oil and Natural Gas Well Regulatory Authority

Part 615, Supervisor of Wells, of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended, regulates oil and natural gas well drilling in Michigan. Revisions to the statute in 1999 clarified the Supervisor’s authority to address public health and safety issues. The Administrative Rules for Part 615 were most recently updated in September 1996. These Rules require classification of wells using the concept of radius of exposure (RoE). A simple formula is used to calculate the distance, in feet, from the point of release at which the H2S concentration in air reaches 100 ppm. This is the 100 ppm RoE. Wells with more than 300 ppm H2S in the gas stream are classified according to the 100 ppm RoE.

Contingency Planning

Contingency plans for public protection are required for wells at which the 100 ppm RoE is greater than 100 feet. The plans are divided into two parts. Part 1 contains general procedures that must be implemented by company personnel in an emergency when H2S is released. This includes emergency contacts and their assigned duties and responsibilities, notification and evacuation procedures for the general public, and procedures for igniting the well. Part II contains site-specific information and must be filed with the application for a drilling permit. Well owners have the option of working with the local Emergency Management Coordinator instead of preparing a required site map and list of residences. This option can be used in highly populated areas. Other H2S Administrative Rules address special equipment requirements for drilling, testing and production of H2S-bearing wells. The Rules are intended to provide for public protection and nuisance odor mitigation.

Local Emergency Capability

Communities that may be affected by oil or natural gas well accidents should have adequate procedures in their Emergency Operations Plans to address the unique types of problems associated with this hazard, including rescue and evacuation. Affected communities must work closely with company officials and surrounding jurisdictions to ensure compatibility of procedures for a fast,

coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied “buffer” areas around refineries and compressor stations. Michigan Department of Environmental Quality regulations provide for buffer zones around wells and treatment and storage facilities.

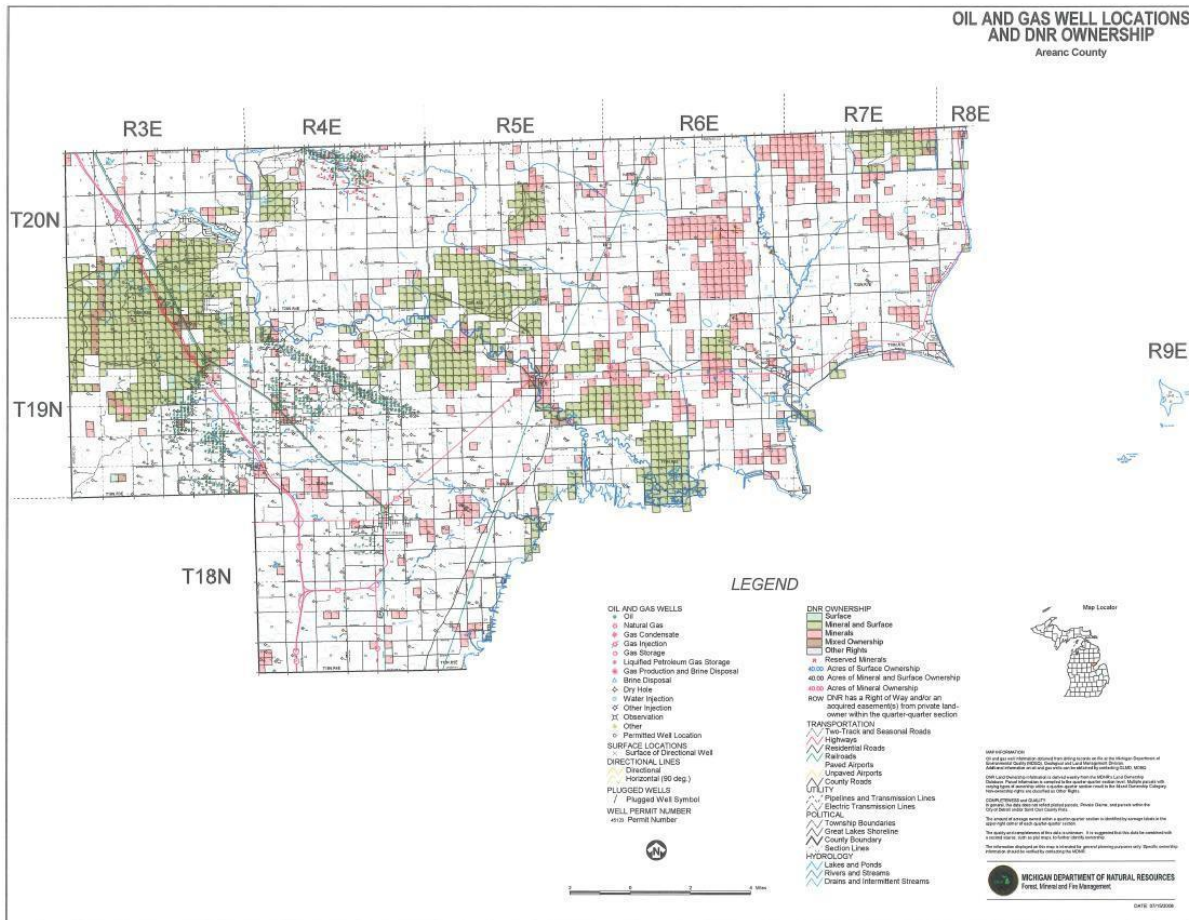


Figure 59: Oil and Gas Wells

Oil and Gas Well Accidents Overview

There are 1125 oil and natural gas wells in Arenac County along with 29.6 miles of gas pipeline. This is a relatively small quantity when compared with state leader, Otsego County, with over 5700 wells. Making planning and response difficult is the fact that a combination of organizations and individuals own the wells. As a rule, most gas companies prefer to respond to incidents involving their wells, and in the vast majority of cases that is what happens. Because gas companies often have controlled burns, and deal with wells daily, it is impossible to ascertain how many incidents have actually occurred in the county. However, there is still the possibility that an emergency response agency could be in the situation of responding to an incident at a gas well. Responders must understand the dangers associated with HS2 and must have a working knowledge of the wells that are in their areas of responsibility. Oil Companies such as Enbridge have maintenance crews who are trained on oil spill boom operations who are available for open water and river water oil spill response.

## **Dam Failures**

The collapse or failure of an impoundment resulting in downstream flooding.

### **Hazard Description**

A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also may be the result of improper operation, lack of maintenance and repair, or vandalism. A common form of dam failure occurs when tree roots disrupt the integrity of an earthen dam. Water can pass through the dam where the soil has been broken apart by the roots. Such failures can be catastrophic because they occur unexpectedly with no time for evacuation.

In Michigan, all dams over 6 feet high that create an impoundment with a surface area of more than 5 acres are regulated by Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. This statute requires the Michigan Department of Environmental Quality (DEQ) to rate each dam as either a low, significant, or high hazard potential. This rating system is based solely on the potential downstream impact if the dam were to fail and is not the physical condition of the dam.

The potential downstream impact is determined by assessing the population concentration and economic activities located downstream from the dam. Dams assigned the low hazard potential rating are those where failure or improper operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property. Dams assigned the significant hazard potential rating are those dams where failure or improper operation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be in areas with higher population and important infrastructure. Dams assigned the high hazard potential classification are those where failure or improper operation will probably cause loss of human life.

Dam owners are required to maintain an emergency action plan (EAP) for significant and high hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans.

### **Existing Prevention Programs**

Both the Michigan Department of Environmental Quality (DEQ) and the Federal Energy Regulatory Commission (FERC) classify and regulate dams in Michigan.

### **Michigan Department of Environmental Quality**

The current Dam Safety Act was passed following a September 1986 flood in central Lower Michigan. During this event 11 dams failed, and 19 others were threatened with failure, resulting in the evacuation of 1500 people from downstream of the dams. The Dam Safety Act is meant to ensure that dams are built and maintained with the necessary engineering and inspections for safety of the public and the environment.

There is only one significant hazard dam in Moffatt Township in Arenac County – the Forest Lake Dam. It was built in 1970 to facilitate the creation of a 1200-person private community. The Forest Lake Association owns it; the reservoir behind is 60 feet in depth; half-mile wide; three miles long? Spillway. Six creek inlets and the only outlet is the Forest Lake Dam empties into the rifle river in Deep River Township. There are very few structures located with the flood plain (reference Figure ? in Chapter 2). The Rifle River flows East until it arrives in Arenac Township; then, it hooks into a southern direction. There are only two structures in the flood plain (Reference Figure ? in Chapter 2). After Arenac Township, the river flows southeast towards Omer, where it drains into Omer Plains and the city of Omer. If Forest Lake Dam were to have a complete breach, the entire Rifle River 500-year Flood Plain would inundate to Saginaw Bay. A Forest Lake Dam Failure's environmental impact would impact the Hardwood forests along the river in Deep River Township. From City of Omer to Hickory Island Rd is rural residential with a high concentration of population per capita in the township. A flood event due to a dam failure would prevent access to buildings, carry people and vehicles away, cause businesses to lose their businesses and inventories, and residents to lose their houses and belongings. Buildings would be damaged, destroyed, and compromised, and would develop mold, rot, and foundation damage from floodwaters. The presence of mold would increase the health risk for populations with breathing conditions. Floodwaters may damage roads, bridges, electrical systems, communication systems, overflow sewers, and impact natural gas tanks where they are at-risk for fire or explosions. Roads may be close for long periods of time, which would impact traffic flow and emergency response times. Floodwaters also can conceal damaged electrical wires and debris. Contaminants and pollutants in the floodwaters can degrade watersheds, and increase the population's risk for diseases, infections, and injuries. Flooding from a dam failure would be costly. Possible evacuation procedures should be put in place, and residents and visitors should be aware of evacuation routes. The Forest Lake Association has a EAP that was reviewed/updated and is in a process of approval by EGLE/new Michigan Dam Safety Association in 2020. Secondary to the Edenville Dam failure of 2020 was the impetus event that cause the creation of the new Michigan Dam Safety Association

The DEQ Dam Safety Program administers the provision of Part 307 and Part 315 of the Natural Resources and the Environmental Protection Act (451 P.A. 1994), as amended. Part 315, Dam Safety, provides for the inspection of dams. This statute requires the DEQ to rate each dam as either low, significant, or high hazard potential, according to the potential downstream impact if the dam were to fail. Dams over 6 feet in height that create an impoundment with a surface area of more than 5 acres are regulated by this statute. Statewide, the DEQ has identified and rated over 2,400 dams. Dam owners are required to maintain an emergency action plan (EAP) for significant and high hazard potential dams. Owners of these dams are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Approximately 240 dams in Michigan come under state regulations requiring EAPs.

Part 307 of The Natural Resources and Environmental Protection Act, (451 P.A. 1994), as amended regulates the construction and maintenance of dams specifically as they relate to inland lakes.

Arenac County Dam Locations (03/2021)

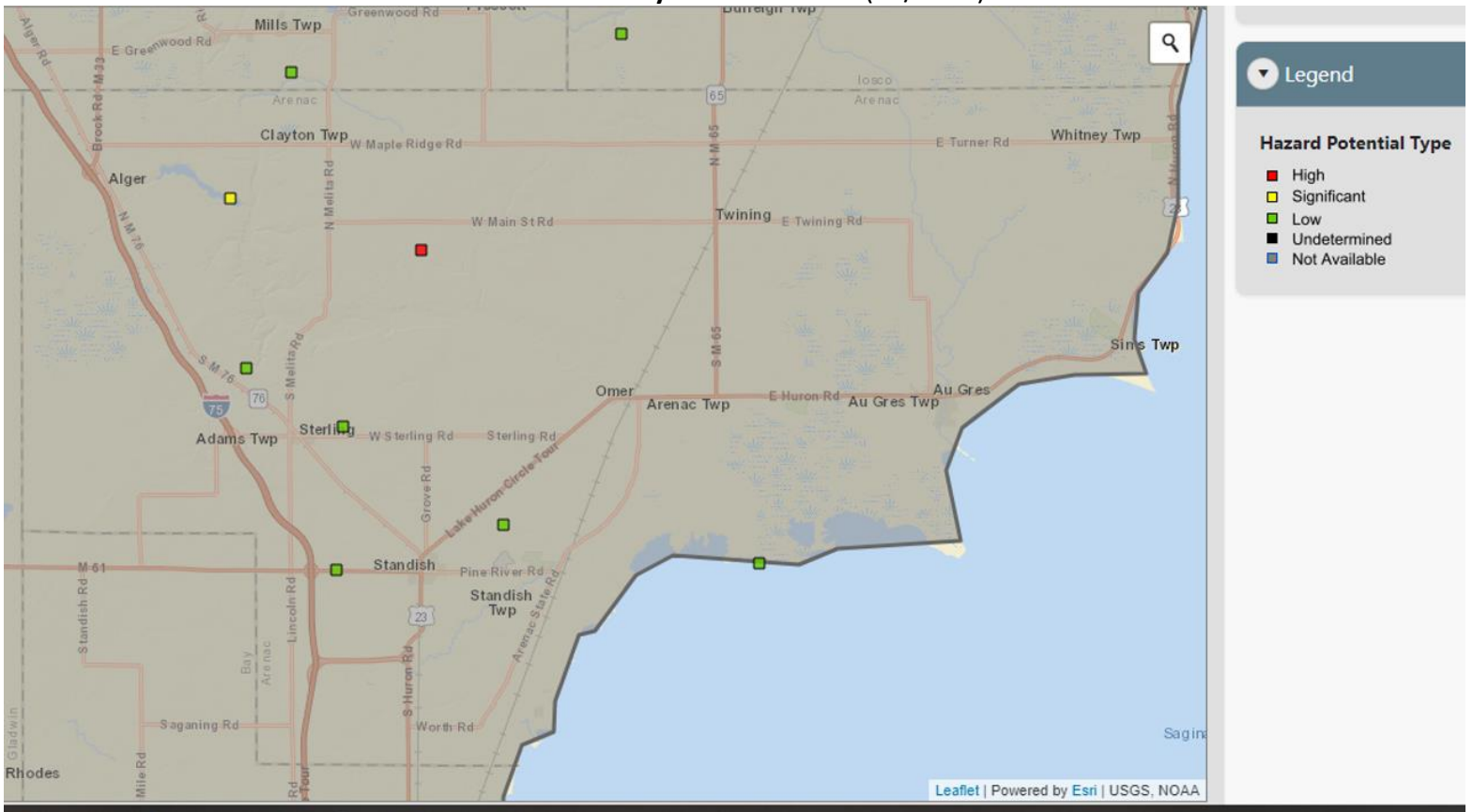


Table 29 - Source: National Inventory of Dams

Arenac County Dam Locations (Army Corp of Engineers Data)				
Name	Location	Height	Hazard Level	EAP
HANCHET POND		10 ft	High	yes
FOREST LAKE DAM	6180 Bobcat Trail, Alger, MI 48610	48 ft	Significant	yes
CHARLYLE DAM	6180 Bobcat Trail, Alger, MI 48610	17 Ft	Low	Not required
CRAKE DAM		14 Ft	Low	Not required
DOLBEE DAM		10 ft	Low	Not required
SENSKE DAM		19 Ft	low	Not required
WIGWAM BAY WILDLIFE AREA DIKE		9 FT	Low	Not required



### Dam Failure Flooding Overview

The Forest Lake Dam in Moffat Township is the only dam that is rated as a significant hazard.

### **Sabotage/Terrorism**

Sabotage/terrorism is an intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Sabotage/terrorism can take many forms or have many vehicles for delivery including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons; 5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations. Because sabotage/terrorism objectives are widely varied, so too are the potential targets of such actions. Virtually any public facility or infrastructure, or place of private or public assembly, can be considered a potential target. In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges/universities.

One of the first acts of domestic sabotage/terrorism ever carried out occurred in Michigan was on May 18, 1927 in Bath. A disgruntled taxpayer and farmer detonated 1,000 pounds of explosives under the newly constructed Bath Consolidated School killing 38 students and 3 teachers and injuring 58 others. The perpetrator then blew himself up, along with the school superintendent. As tragic as that event was, it could have been worse were it not for the fact that half of the explosives failed to detonate as planned. Activities to prevent terrorist activities have become even important and in the wake of the 9/11 events of destruction in New York City and Washington D.C. Many more resources may be mobilized to prevent terrorist activities in the future.

Although at first it might appear Arenac County is an unlikely target for terrorism, it cannot be totally discounted. Potential targets include the water treatment plant, the downtown areas and government buildings, and all industrial sites in the area. Furthermore, any government building, school, individual, or group of individuals can become a target of domestic terrorism.

### **Transportation Accidents: Air, Land, and Water**

A crash or accident involving an air, land or water-based commercial passenger carrier resulting in death or serious injury.

### Hazard Description

#### Air Transportation Accidents

There are four circumstances that can result in an air transportation accident:

1. An airliner colliding with another aircraft in the air.
2. An airliner crashing while in the cruise phase of a flight due to mechanical problems, sabotage, or other cause.

3. An airliner crashing while in the takeoff or landing phases of a flight.
4. Two or more airliners colliding with one another on the ground during staging or taxi operations.

When responding to any of these types of air transportation accidents, emergency personnel may be confronted with a number of problems, including:

1. Suppressing fires.
2. Rescuing and providing emergency first aid for survivors.
3. Establishing mortuary facilities for victims.
4. Detecting the presence of explosive or radioactive materials.
5. Providing crash site security, crowd and traffic control, and protection of evidence.

#### Land Transportation Accidents

A land transportation accident in Michigan could involve a commercial intercity passenger bus, a local public transit bus, a school bus, or an intercity passenger train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, a bus slipping off a roadway in inclement weather or colliding with another vehicle causes bus accidents. Intercity passenger train accidents usually involve a collision with a vehicle attempting to cross the railroad tracks before the train arrives at the crossing. Unless the train accident results in a major derailment, serious injuries are minimal. Bus accidents, on the other hand, can be quite serious – especially if the bus has tipped over. Numerous injuries are possible in these types of situations.

With five major state and federal highways, an active railroad, and 50 plus miles of Lake Huron shoreline, Arenac County has great potential for transportation accidents.

#### Air Transportation

The Michigan Aeronautics Commission of the Michigan Department of Transportation administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include:

1. Registering aircraft dealers, aircraft, and engine manufacturers.
2. Licensing airports and flight schools.
3. Inspecting surfaces and markings on airport runways.
4. Assisting in removal of airspace hazards at airports.

The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety.

The Federal Aviation Administration (FAA) contracts with the Michigan Department of Transportation for the inspection of the state's 238 public-use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings (see the NTSB section below).

### Land Transportation

School bus safety programs and initiatives generally fall into two categories:

1. Driver skill and competency training.
2. Physical inspections of bus mechanical and safety equipment.

The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.

Local transit and intercity bus safety falls under the purview of the Michigan Department of Transportation's Bureau of Urban and Public Transportation. Generally, the issue of intercity and transit bus safety is handled on a partnership basis with the service providers, with MDOT providing oversight of the initiatives undertaken by the providers to ensure mechanical and operational safety.

The Michigan Department of Transportation is the state regulatory agency for railroad-highway grade crossing safety issues. In this role, MDOT conducts biennial, on-site crossing reviews for Michigan's 5,535 public crossings and reports observed crossing maintenance deficiencies to the responsible railroad or roadway authority. In addition, MDOT conducts diagnostic study team reviews at selected crossings to determine whether the current level of warning devices require enhancement. At the present time, 42% of Michigan's public crossings have automatic side-of-street flashing light signals and 16% have automatic gates.

In January 2001, an amendment (367 P.A. 2000) to the Michigan Vehicle Code went into effect allowing the MSP, MDOT, or specified local officials to install video cameras at railroad crossings to serve as a deterrent to motorists who might attempt to go around or through activated railroad crossing lights and gates. Although the ultimate purpose of this law is to reduce pedestrian and vehicular deaths and injuries at railroad crossings, the law will also likely reduce passenger train accidents caused by collisions with vehicles on the tracks, a major cause of many passenger train derailments.

Michigan's "Operation Lifesaver" Coalition part of a national, non-profit education and awareness program dedicated to ending tragic collisions, fatalities and injuries at highway-rail grade crossings.

and on railroad rights of way has helped reduce the number of serious crashes at railroad crossing in the state. The Operation Lifesaver coalition in Michigan is spearheaded by the MSP and MDOT and is comprised of state and local government officials, law enforcement, and employees of the railroad companies operating in Michigan. The Operation Lifesaver program emphasizes education and enforcement, and its efforts appear to be working. Since 1996, the number of crashes, injuries, and fatalities at railroad crossing in Michigan has shown a steady decline.

Another MDOT program that helps improve rail safety is the Michigan Rail Loan Assistance Program. Established under Act 117, P.A. 1997, this program was initiated to help finance capital improvements on Michigan's rail infrastructure. Although the program is designed primarily to help preserve and improve rail freight service, any improvements made to the rail infrastructure that serves passenger rail service can only help improve passenger rail safety. Track rehabilitation is one of the eligible projects that can be funded under this program; the safety value of a project is one of the primary selection criteria.

#### National Transportation Safety Board

The National Transportation Safety Board is an independent federal agency responsible for promoting aviation, highway, railroad, marine, pipeline, and hazardous materials transportation safety. The NTSB is mandated to investigate significant transportation accidents, determine the probable cause of such accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB publicizes its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews. Although the NTSB has no regulatory or enforcement powers, it has nonetheless been successful in seeing the adoption and implementation of over 80% of its recommendations from transportation accident investigations.

### **Petroleum and Natural Gas Pipeline Accidents**

An uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

#### Hazard Description

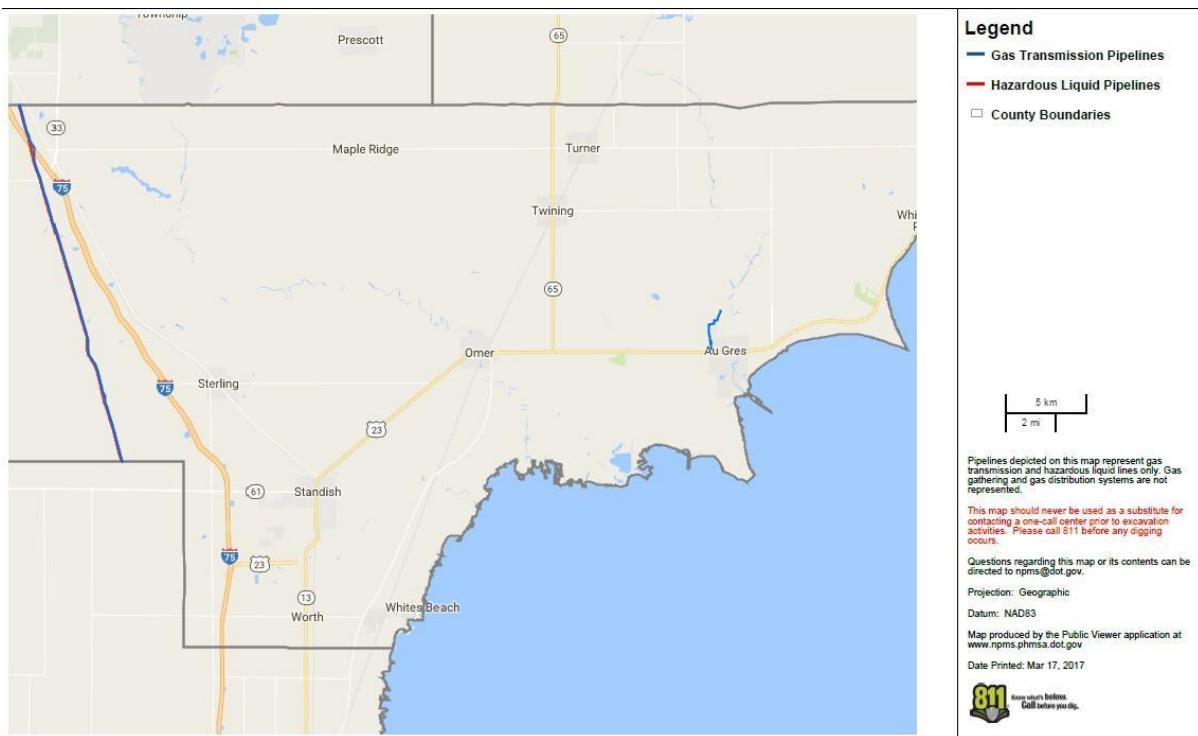
Though often overlooked, petroleum and natural gas pipelines pose a real threat in many Michigan communities. Petroleum and natural gas pipelines can leak or fracture and cause property damage, environmental, contamination, injuries, and even loss of life. The vast majority of pipeline accidents that occur in Michigan are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the Michigan Public Service Commission (MPSC), approximately 25% of the natural gas consumed in Michigan is produced within the state. The remaining 75% is imported by five interstate pipeline companies that have access to the major natural gas producing regions in North America. Michigan cycles more natural gas through its storage system than any other state. Michigan ranks 11<sup>th</sup> in the nation in production of natural gas and ranks 6<sup>th</sup> in consumption at 937.2 billion cubic feet. Michigan's

petroleum product consumption in 1997 was 189 million barrels, ranking it 10<sup>th</sup> nationally.

These figures underscore the fact that vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the state, making many areas vulnerable to petroleum and natural gas emergencies. Michigan’s gas and petroleum networks are highly developed and extensive, representing every sector of the two industries from wells and production facilities to cross-country transmission pipelines, that bring the products to market, to storage facilities, and finally to local distribution systems.

The petroleum and natural gas industries have historically had a good safety record and pipelines are by far the safest form of transportation for these products, but the threat of fires, explosions, ruptures, and spills nevertheless exists. In addition to these hazards, there is the danger of hydrogen sulfide (H2S) release. These dangers (explained in the Oil and Natural Gas Well Accidents section) can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has a high sulfur content.



**Figure 60: Gas and Hazardous Pipelines in Arenac County**

Arenac County has one major pipeline – Line 5 Pipeline that generally follows I75. There are a number of smaller pipelines in the Sterling area that connect oil and gas wells, mainly in Adams and Deep River Townships

Pipeline jurisdiction and oversight in Michigan is complex, determined primarily by the type and function of a pipeline and its location. Agencies involved include:

1. The Michigan Public Service Commission (MPSC) Gas Safety Office.
2. The U.S. Department of Transportation/Office of Pipeline Safety (USDOT/OPS) in Kansas City, Missouri.
3. The Michigan Department of Environmental Quality, Geological Survey Division (MDEQ/GSD).

The table below is a breakdown of jurisdictional and inspection responsibilities for the various types of pipelines present in Michigan:

Pipeline Safety Regulation in Michigan

<b>Pipeline Type</b>	<b>Jurisdiction</b>	<b>Applicable Code</b>	<b>Inspected By</b>
Inter-state Natural Gas	USDOT/OPS	49 CFR Part 192	MPSC Gas Safety
Intra-state Natural Gas	State of Michigan/MPSC	Michigan Gas Safety Standards	MPSC Gas Safety
Liquid Petroleum	USDOT/OPS	49 CFR Parts 193/195	USDOT/OPS
Gathering Lines*	MDEQ/GSD	Oil/Gas Administrative Rules under Part 615, 1994 P.A. 451	MDEQ/GSD

**Table 30**

\*Note: Gathering lines run from a production facility (i.e., well) to pre-processing plant (i.e., dehydration facility, separator, and compression station).

The issue of gathering line jurisdiction is even more complex. Gathering lines in non-rural areas fall under the jurisdiction of the Michigan Gas Safety Standards. Gathering lines that serve as common carriers fall under the jurisdiction of the MPSC but may not necessarily fall under the Michigan Gas Safety Standards. All other gathering lines fall under the jurisdiction of the MDEQ/GSD.

Michigan Gas Safety Standards

Pipeline operators are regulated under the Michigan Gas Safety Standards Act, 165 P.A. 1969 and associated Administrative Rules (known as the Michigan Gas Safety Standards), to ensure public safety is protected to the extent possible in the transportation of gas by pipeline. Under the Standards (which are administered by the MPSC), gas pipeline companies (operators) must develop and maintain written procedures to minimize the hazard resulting from a gas pipeline emergency. The procedures must provide for the following:

1. Identification and classification of events.
2. Notification of and communication with local response agencies and public officials.

3. Response to all types of gas emergencies, including emergency shutdown and pressure reduction procedures.
4. Coordination of response actions with the local jurisdiction(s).
5. Restoration of service.

Operators must also ensure that personnel are properly trained and knowledgeable concerning emergency procedures. If an incident occurs, the operator must review response actions to determine if procedures were followed, and if necessary, take samples of the failed facility or equipment for laboratory examination to determine the cause of the failure. Mitigative actions are taken as necessary to minimize the possibility of a recurrence.

#### MPSC Pipeline Safety Inspections

Safety engineers from the MPSC are certified by the USDOT/OPS to conduct inspections on gas and petroleum pipelines to ensure structural and operational integrity of the systems. If violations are found, the pipeline company can be ordered to take corrective actions; in addition, the pipeline operator may be fined. The MPSC safety engineers also respond to accidents involving natural gas or petroleum pipelines to ensure compliance with federal and state law and to offer technical assistance to emergency responders.

#### Protection of Underground Facilities Act/MISS DIG Program

Michigan's first line of defense against pipeline and other utility line breaks from construction excavation is the "MISS DIG" Program established with the passage of Act 53 in 1974 – The Protection of Underground Facilities. Miss DIG System, Inc., is a 24-hour utility communications system that helps contractors comply with the state law (Act 53) which requires notification of utilities at least three working (but not more than 21 calendar) days before commencing excavation, tunneling, demolishing, drilling or boring procedures. It does an excellent job of minimizing pipeline and utility line accidents.

#### U.S. Department of Transportation, Office of Pipeline Safety

Federal pipeline safety requirements are contained in the Federal Safety Standards (Parts 191, 192, 193 and 195), as administered by the USDOT/OPS. Interstate gas and liquid petroleum pipeline operators must develop and maintain written emergency procedures similar to those required under the Michigan Gas Safety Standards. In addition, they are required to coordinate both planned and actual response actions with local officials and response agencies. Part 195 also has a continuing education requirement to keep local officials and the general public informed about the risks associated with the transportation of hazardous liquids via pipeline.

#### National Transportation Safety Board

The National Transportation Safety Board (NTSB) investigates all significant pipeline accidents that occur in this country and issues safety recommendations to the pipeline company and government regulators aimed at preventing future accidents. (To date, only the August 2, 1975 pipeline accident in Romulus has resulted in an NTSB pipeline investigation in Michigan.) The NTSB also publishes a list of "most wanted" safety improvements for pipelines and other modes of transportation for nationwide implementation by appropriate entities. Although these safety improvement



recommendations are not mandatory, and the NTSB has no regulatory or enforcement powers, it nonetheless has been successful in getting more than 80% of its recommendations adopted. Many safety features currently incorporated into pipelines and other transportation modes had their genesis in NTSB recommendations.

### Local Emergency Capability

Communities that may be affected by petroleum or natural gas emergencies should have adequate procedures in their Emergency Operations Plans to address the unique problems associated with this hazard, including specific functions such as rescue and evacuation. Affected communities must work closely with company officials and surrounding jurisdictions to ensure a fast, coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied “buffer” areas around pipelines, storage fields, refineries, and compressor stations.

### Civil Disturbance

A civil disturbance is a public demonstration or gathering or a prison uprising that results in a disruption of essential functions, rioting, looting, arson or other unlawful behavior. Large-scale civil disturbances rarely occur, but when they do they are usually the result of one or more of the following events: 1) labor disputes where there is a high degree of animosity between the two dissenting parties; 2) high profile/controversial judicial proceedings; 3) the implementation of controversial laws or other governmental actions; 4) resource shortages caused by a catastrophic event; 5) disagreements between special interest groups over a particular issue or cause; or 6) a perceived unjust death or injury to a person or persons of concern to a particular segment of society.

Areas subject to civil disturbances may encompass large portions of a community. Types of facilities that may be subject to or adversely impacted by civil disturbances include government buildings, military bases, community colleges, businesses, and critical service facilities such as our hospital, police and fire facilities. Civil disturbances (including jail uprisings) often require the involvement of multiple community agencies to respond to, and to recover from, the incident.

### Riverine Flooding

The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice. The meeting participants stated that there has been history of riverine flooding of the Rifle River and its tributaries in the county.

### Hazard Description

Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were still in their natural states, floods would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes. Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they

may be unable to reach their homes at all. Long-term collateral dangers include the outbreak of disease, widespread animal death, and broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks, rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will flow into the lowest elevations surrounding a water course. This type of flooding is becoming increasingly prevalent in Michigan, as development outpaces the ability of the drainage infrastructure to carry and disburse the water flow properly. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the flow of water that often accompanies storm events, the result of which is water backing into basements with damage to mechanical systems and the possibility of creating serious public health and safety problems.

#### Ice Jams

Cold winters, such as those we experience in Arenac County, can produce thick river ice and the potential for ice jams. An ice jam develops when pieces of snow and ice buildup along and in a river. As the ice buildup increases, water slows, and flooding develops behind the dam of ice. Water levels can also rise rapidly when temperatures rise and result in snowmelt runoff or rain, thus adding more water to the river behind an ice jam.

In the spring, or when temperatures rise, the ice buildup will thaw and break up and may unleash all the damned-up water in a short period of time. When this occurs, flooding can rapidly result downstream from the ice jam. The combination of ice, debris, and water released from the ice jam can cause tremendous physical damage to homes, docks, and other structures.

The Rifle River that crosses Moffatt, Clayton, Deep River and Arenac Townships floods often. The AuGres River that traverses Turner, Whitney, Sims and AuGres Townships also floods often. The Pine River branches flowing through Lincoln, Standish, Deep River and Arenac Townships and also flood occasionally (See Flood Plain Maps pgs 38-44).

#### Recent Flood Events in Arenac County

The Rifle River that crosses Moffatt, Clayton, Deep River and Arenac Townships floods often. The AuGres River that traverses Turner, Whitney, Sims and AuGres Townships also floods often. The Pine River branches flowing through Lincoln, Standish, Deep River and Arenac Townships and also flood occasionally (See Flood Plain Maps pgs 38-44). In February 2018, the second highest water level flooding event was recorded on the Rifle River since 1950. In February 2019, the AuGres River flooded the entire spring and summer due to high Great Lakes levels not allowing river drainage.

### National Weather Service Doppler Radar

The National Weather Service has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property – including weather events that can lead to riverine flooding. Most important, the lead-time and specificity of warnings for severe weather have improved significantly.

### National Weather Service Watches/Warnings

The National Weather Service issues flood watches and flood warnings when conditions are right for flooding. A flood watch indicates meteorological conditions are conducive to flooding. People in the watch area are instructed to stay tuned to local radio or television stations for updates on flooding and weather conditions. When flooding is imminent, a flood warning is issued. The warning will identify the anticipated time, level and duration of flooding. Persons in areas that will be flooded are instructed to take appropriate protective actions, up to and including evacuation of family members and removal or elevation of valuable personal property.

State and local government agencies are warned of flood watches and warnings by the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio, and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The NWS stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The NWS also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN) and “weather.gov”.

### Severe Weather Awareness Week

Each spring, the Michigan Department of State Police Emergency Management Division, in conjunction with Michigan Severe Weather Awareness Committee, sponsors a Severe Weather Awareness Week. This annual public information campaign focuses on severe weather hazards such as tornadoes, thunderstorms, lightning, hail, high winds, and flooding. Informational materials on flooding and the other severe weather hazards are disseminated to schools, hospitals, nursing homes, other interested community groups and facilities, and the general public.

### Michigan Flood Hazard Regulatory Authorities

Land Division Act, 591 P.A. 1996, as amended by 87 P.A. 1997

The Land Division Act governs the subdivision of land in Michigan. The Act requires review at the local, county and state levels to ensure the land being subdivided is suitable for development. From a flood hazards viewpoint, a proposed subdivision is reviewed by the County Drain Commissioner for proper drainage, and for floodplain impacts by the Department of Environmental Quality, Land and Water Management Division.

Provisions of the Act and its Administrative Rules require that the floodplain limits be defined and prescribe minimum standards for new developments for residential purposes and occupancy, within or affected by the floodplain. Restrictive deed covenants are filed with the final plat which stipulate that any building used, or capable of being used, for residential purposes and occupancy within or

affected by the floodplain shall meet the following conditions:

- Be located on a lot having a buildable site of 3,000 square feet of area at its natural grade above the floodplain limit. (Lots with less than 3,000 square feet of buildable area may be filled to achieve that area.)
- Be served by streets within the proposed subdivision having surfaces not lower than one foot below the elevation defining the floodplain limits.
- Have lower floors, excluding basements, not lower than the elevation defining the floodplain limits.
- Have openings into the basement not lower than the elevation defining the floodplain limits.
- Have basement walls and floors below the elevation defining the floodplain limits, watertight and designed to withstand hydrostatic pressures.
- Be equipped with a positive means of preventing sewer backup from sewer lines and drains serving the building.
- Be properly anchored to prevent flotation.

Floodplain Regulatory Authority, found in Water Resources, Part 31 of the Natural Resources and Environmental Act, 451 P.A. 1994, as amended.

The floodplain regulatory portion of Act 451 restricts residential occupation of high-risk flood hazard areas and ensures that other occupations do not obstruct flood flows. A permit is required from the Department of Environmental Quality for any occupation or alteration of the 100-year floodplain. In general, construction and fill may be permitted in the portions of the floodplain that are not floodway, provided local ordinances and building standards are met. (Floodways are the channel of a river or stream and those portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the 100-year flood. These are areas of moving water during floods.) New residential construction may be permitted in the floodway, although a hydraulic analysis may be required to demonstrate that the proposed construction will not harmfully affect the stage-discharge characteristics of the watercourse.

The Act does not apply to watersheds that have a drainage area of less than two square miles. Those small watersheds are considered to be local drainage systems, and do not fall under the Floodplain Regulatory Authority.

Soil Erosion and Sedimentation Control, Part 91 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended.

This portion of the Act seeks to control soil erosion and protect the waters of the state from sedimentation. A permit is required for all earth changes that disturb one or more acres of land, as well as those earth changes that are within 500 feet of a lake or stream. The Act itself does not address flood hazards, per se. However, if sedimentation is not controlled, it can clog streams, block culverts, and result in continual flooding and drain maintenance problems.

Inland Lakes and Streams, Part 301 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended.

This portion of the Act regulates all construction, excavation, and commercial marina operations on the State's inland waters. It ensures that proposed actions do not adversely affect inland lakes, streams, connecting waters and the uses of all such waters. Structures are prohibited that interfere with the navigation or natural flow of an inland lake or stream. Though reduction of flooding is not a specific goal of this Act, minimizing restrictions on a stream can help to reduce flooding conditions.

Wetlands Protection, Part 303 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended.

This portion of the Act requires a permit from the Department of Environmental Quality for any dredging, filling, draining or alteration of a wetland. This permitting process helps preserve, manage, and protect wetlands and the public functions they provide – including flood and storm water runoff control. The hydrologic absorption and storage capacity of the wetland allows wetlands to serve as natural floodwater and sedimentation storage areas. The Act recognizes that the elimination of wetland areas can result in increased downstream flood discharges and an increase in flood damage. Permits for wetland alterations are generally not issued unless there is no feasible alternative and the applicant can demonstrate that the proposal would not have a detrimental impact upon the wetland functions.

Natural Rivers Program, Part 305 of the Natural Resources and Environmental Protection Act, 451, P.A. 1994, as amended.

The Natural Rivers Act was originally passed in 1970 and has been incorporated as Part 305 of the Natural Resources and Environmental Protection Act. The purpose of this program is to establish and maintain a system of outstanding rivers in Michigan, and to preserve, protect, and enhance their multi-faceted values. Through the natural river's designation process, a Natural River District is established (typically 400 feet either side of the riverbank) and a zoning ordinance is adopted. Within the Natural River District, permits are required for building construction, land alteration, platting of lots, cutting of vegetation, and bridge construction. Not all of the zoning ordinances on the natural rivers have the same requirements, but they all have building setback and vegetative strip requirements. Although the purpose is not specifically to reduce flood losses, by requiring building setbacks (in many cases prohibiting construction in the 100-year floodplain), flood hazard mitigation benefits can be realized.

Dam Safety, Part 315 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended.

The Dam Safety Unit within the Land and Water Management Division, Department of Environmental Quality, has the primary responsibility to ensure dam safety within the state. Following the September, 1986 flood in central Lower Michigan, the current Dam Safety Act was passed to ensure that dams are built and maintained with necessary engineering and inspections for safety of the public and the environment. The Department of Environmental Quality is required to review applications involving construction, reconstruction, enlargement, alteration, abandonment, and removal for dams that impound more than five acres of water and have a height of six feet or more.

The Drain Code, 40 P.A. 1956, as amended.

The Drain Code of 1956, commonly known as Act 40, establishes laws relating to the laying out and consolidation of drainage districts, and the maintenance of drains, sewers, pumping equipment, bridges, culverts, fords, and other structures and mechanical devices to ensure that the drains function properly. The Drain Code also provides for the development of flood control and water management projects, the creation of water management districts and sub districts, and for flood control and drainage projects within drainage districts. To obtain funding for drain and water management projects, this Act provides for the assessment and collection of taxes, the investment of funds, and the deposit of funds for future maintenance of drains. Also, it authorizes public corporations to impose taxes for the payment of assessments in anticipation of which bonds are issued, provides for the issuance of bonds by drainage districts and for the pledge of the full faith and credit of counties for payment of the bonds; it authorizes counties to impose taxes when necessary to pay principal and interest on bonds for which full faith and credit is pledged, validates certain acts and bonds, and prescribes penalties.

Drainage districts and drains are established by petition of the affected landowners and/or municipalities. County drains, with a special assessment district entirely within the County, are administered by the locally elected County Drain Commissioner. Inter-county drains, with a special assessment district in more than one county, are administered by a drainage board which consists of the drain commissioners of the affected counties and is chaired by the Director of the Michigan Department of Agriculture (MDA) or an MDA Deputy Director.

Act. 96 P.A. Manufactured Housing Commission 1987, as amended.

The Michigan Manufactured Commission Act and its implementing Administrative Rules provide regulation on the placement of manufactured homes and establishes construction criteria. Manufactured homes are prohibited from being placed within a floodway, as determined by the Department of Environmental Quality. In addition, manufactured homes sited within a floodplain must install an approved anchoring system to prevent the home from being moved from the site by floodwaters (or high winds) and be elevated above the 100-year flood elevation.

Local River Management Act, 253 P.A. 1964

Enacted in 1964, the Local River Management Act provides for the coordination of planning between local units of government in order to carry out a coordinated water management program. Implementation of the water management program occurs via the establishment of watershed councils. These councils conduct studies on watershed problems, water quality, and the types of land uses occurring within the watershed. Watershed councils have the authority to develop River Management Districts for the purpose of acquisition, construction, operation and the financing of water storage and other river control facilities necessary for river management. The provision to allow acquisition of land adjacent to the river for the purpose of management aids in regulating development of land prone to flooding.

### Floodplain Service Program

The need to identify a flood hazard area before construction is essential to the goal of flood hazard mitigation. The Department of Environmental Quality regularly provides floodplain information to public and private interests as part of its Floodplain Service Program under the Land and Water Management Division. The goal of the program is to provide 100-year floodplain information to interested parties so that informed purchase or development decisions can be made. In addition to providing floodplain information, the MDEQ will provide information on land and water “interface” permit requirements and on building requirements relating to construction in flood hazard areas.

### National Flood Insurance Program

For many years, the response to reducing flood damages followed a structural approach of building dams and levees and making channel modifications. However, this approach did not slow the rising cost of flood damage, plus individuals could not purchase insurance to protect themselves from flood damage.

The National Flood Insurance Program (NFIP) was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that:

1. Require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year floodplain elevation.
2. Allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect).
3. Require anchoring of manufactured homes in flood prone areas.

The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed. In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan or any construction or building within the 100-year floodplain.

Currently, there are about 25,956 flood insurance policies in force in Michigan, which amounts to approximately \$2.5 billion worth of coverage. About 18,621 (71.1%) of these policies are within an identified flood hazard area, and the remainder are for properties located outside flood hazard areas. Officials from FEMA and the MDEQ estimate that only 15% of all flood prone structures in Michigan eligible to purchase flood insurance actually have flood insurance. Furthermore, since only about 40% of the communities in Michigan participate in the NFIP, there are thousands of structures that are flood prone, but are not eligible to purchase flood insurance.

### Flood Mitigation Assistance Program

With the passage of the National Flood Insurance Reform Act of 1994, Congress authorized the establishment of a federal grant program to provide financial assistance to states and local communities for flood mitigation planning and activities. The Federal Emergency Management Agency (FEMA) has designated this the Flood Mitigation Assistance Program (FMAP). The FMAP funds can be used to fund activities that reduce the risk of flood damage to structures insurable under the National Flood Insurance Program. The FMAP is state-administered (jointly by the department of State Police and the Department of Environmental Quality) and cost-shared on a 75% federal, 25% local basis.

Three types of FMAP grants are available:

1. Planning grants to assist local communities in developing flood mitigation plans.
2. Project grants to fund eligible flood mitigation projects, with emphasis on repetitively or substantially damaged structures insured under the NFIP.
3. Technical assistance grants to assist the State in providing technical assistance to applicants in applying for the program or implementing approved projects.

### Flood Management and Mitigation Education

The Land and Water Management Division, Department of Environmental Quality, has developed two guidance documents aimed at local officials involved in floodplain management and flood hazard mitigation. These guidebooks are used as textbooks in training workshops and as a reference for day-to-day activities.

The Emergency Management Division of the Michigan State Police, has developed a local hazard mitigation planning handbook for local officials. This guidance document provides an overview of a planning process that communities can follow to help reduce their vulnerability to a wide array of natural, technological and human-made hazards – including riverine flooding.

Both the Land and Management Division and Emergency Management Division regularly conduct floodplain management and flood hazard mitigation training courses and workshops for state and local officials. The Land and Water Management Division also conducts regular community assistance contacts and visits as part of its administrative duties under the National Flood Insurance Program. Such contacts and visits are a form of training aimed at improving a community's implementation of floodplain management practices. In addition, the Land and Water Management Division continuously conducts flood hazard workshops for lenders, realtors, building officials, engineers, citizens and any other interested parties.

### Road Infrastructure Flood Mitigation Committee

Following the September 1986 floods, the Michigan Department of Transportation (MDOT) formed a flood mitigation committee to determine ways to lessen damage to road infrastructure caused by riverine flooding. The committee consisted of representatives from the County Road Association of Michigan, the Federal Highway Administration, the Department of Environmental Quality, and MDOT. One of the primary purposes of the committee was to identify reasons for failed stream crossings and damaged roads during a flood event and to make recommendations for achieving more flood-resistant stream crossings. The committee published its findings and recommendations in a report



that is used today as a reference guide for officials involved in road infrastructure design and maintenance.

As a result of one of the committee's recommendations, the Department of Environmental Quality regularly sponsors workshops and seminars on stream crossing design and erosion control practices. These workshops are geared toward design engineers at the state, county and local levels, in addition to private consultants and county drain commissioners.

### State and Federally Assisted Relocation of Flood Prone Properties

The State of Michigan has been very pro-active in its initiation and participation in the acquisition and relocation of flood prone properties, in both pre- and post- disaster situations. Typically, properties are purchased by the local unit of government using federal Hazard Mitigation Grant Program (HMGP) and Flood Mitigation Assistance Program funds. In Michigan, the HMGP is administered by the Michigan Department of State Police Emergency Management Division.

### Other State and Federally Assisted Flood Hazard Mitigation Projects

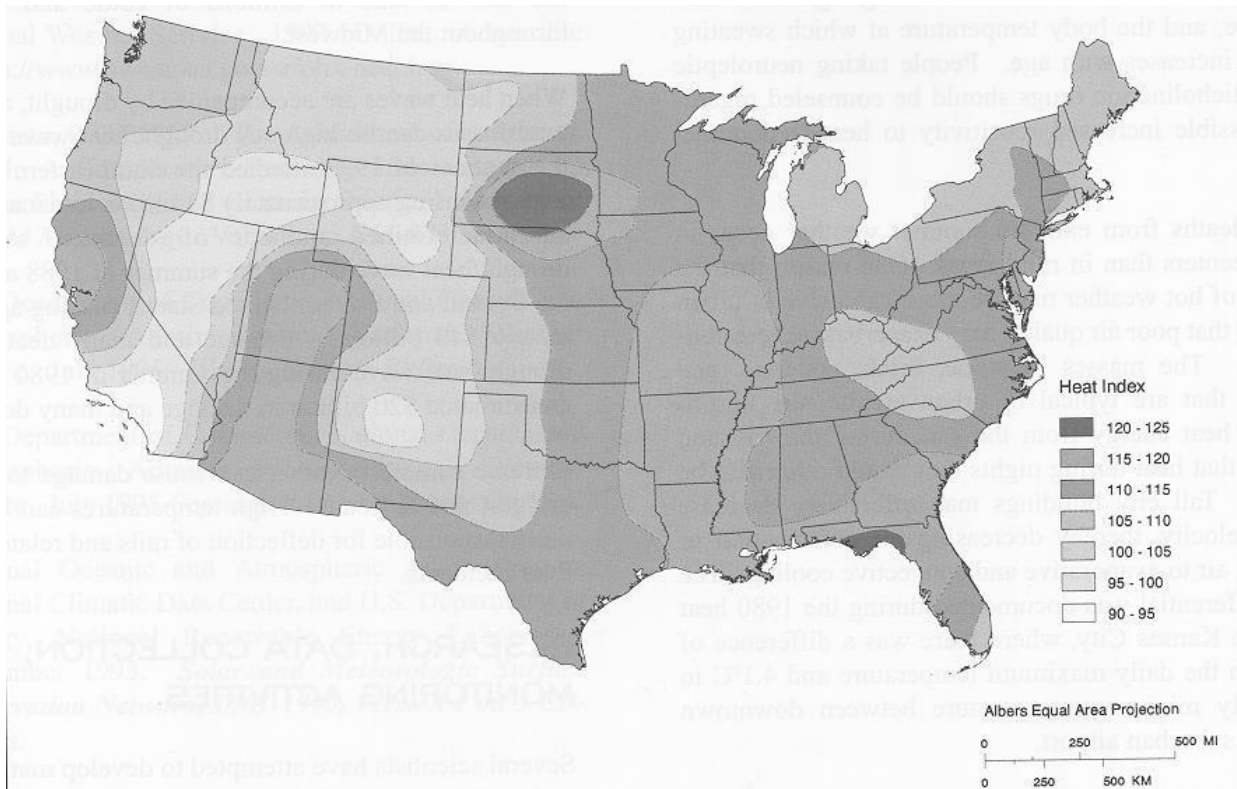
The State of Michigan has used a variety of federal funding sources to assist in the implementation of flood hazard mitigation projects. Those funding sources have included:

1. The Hazard Mitigation Grant Program (HMGP).
2. The Flood Mitigation Assistance Program (FMAP).
3. The Public Assistance Grant Program (PAGP).
4. The Individual and Family Grant Program (IFGP).
5. Community Development Block Grants (CDBG).
6. Farmers Home Administration (FmHA) loans.

State and local funds have also been used to match the federal sources of funding. See the Arenac County Repetitive Loss Assessment on page 223.

## **Extreme Temperatures**

Prolonged periods of very high or very low temperatures, often accompanied by exacerbating conditions such as high humidity and lack of rain, or heavy snowfall and high winds. Extreme temperatures – whether it is extreme heat or extreme cold – share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, impoverished individuals, and people in poor health. The major threats of extreme heat are heatstroke (a major- medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense. The major threats of extreme cold are hypothermia (also a major-medical emergency) and frostbite. Michigan is subject to both temperature extremes.



**Figure 62: Heat Index**

Arenac County is susceptible to both extreme heat and extreme cold. The temperate climate of southern Michigan, and the effects of Lake Huron, make for extreme deviations in temperature. 50-degree swings in the temperature in a 24-hour period are not uncommon.

The earlier section on Severe Winter weather (p 119) discusses the effects of extreme cold in Arenac County. Extremely high temperatures are rare in the county as our climate is tempered and cooled by the Great Lakes.

**1 EXTREME TEMPERATURE** event(s) were reported in **Arenac County, Michigan** between **01/01/1950** and **12/30/2016**. Source: National Climatic Data Center

### **Drought**

Drought is a water shortage caused by a deficiency of rainfall, generally lasting for an extended period of time.

#### **Hazard Description**

Drought is the consequence of a reduction in the amount of precipitation that was expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation.

A drought can cause severe hardships for communities and regions. Probably one of the most common and severe impacts to a community like Arenac County would be the threat of wildfires as 53 percent of the County is forested. Also, there would be a drop in the quantity and quality of agricultural crops. Other negative impacts that can be attributed to a drought include water shortages for human consumption, industrial, business and agricultural uses, recreation and navigation, declines in water quality in lakes, streams and other natural bodies of water, malnourishment of wildlife and livestock, increases in fires and wildfire related losses of timber, homes, and other property, increases in wind erosion, and declines in tourism in areas dependent on water-related activities.

These direct impacts can further result in indirect impacts to a community, such as reduced revenue due to income losses in agriculture, retail, tourism and other economic sectors; declines in land values due to physical damage from the drought conditions and decreased functional use of the property, and possible loss of human life due to extreme heat, fire, and other heat-related problems.

Two common measurement tools of dry weather conditions are the Palmer Drought Indices (including the Palmer Drought Severity Index and the Palmer Hydrological Drought Index) and the Crop Moisture Index. The Palmer Drought Severity Index is a good long-term drought monitoring tool. It is a monthly index that indicates the severity of a wet or dry spell. This index is based on average temperature and rainfall information for a particular location in a formula to determine dryness. It uses a value of 0 for the normal amount of rainfall in a particular location, and drought is shown in terms of negative numbers, for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. Any value above 0 demonstrates that there have been above normal amounts of precipitation. This index can be used for indicating lake levels and surface water supply abnormalities, but it is not good for monitoring climatic impacts on vegetation, especially crops.

The Crop Moisture Index (CMI) evaluates short-term moisture conditions across crop producing regions. The CMI measures how much moisture is in the plant root zone of the soil. This index is based on the mean temperature and total precipitation that occurs each week, as well as the CMI from the previous week. The CMI changes as quickly as the weather changes. A heavy rainstorm can dramatically change the CMI for a region. Since this index changes so quickly and in response to a single weather event, the CMI is not considered a good long-term drought measurement tool.

Fortunately, Arenac County has not experienced a severe drought in recent history.

Droughts/Drought Related Events in Arenac County

**0 DROUGHT** event(s) were reported in **Arenac County, Michigan** between **01/01/1950** and **12/30/2016**. Source: National Climatic Data Center

National Drought Policy Act and Commission

Currently, no single federal or state agency monitors drought. Rather, a number of agencies have programs and initiatives in place designed to identify, monitor, analyze, and respond to drought. Recognizing the need for a nationwide, coordinated drought policy designed to prepare for and respond to drought emergencies, Congress enacted in 1998 the National Drought Policy Act (P.L. 105-199), which established the National Drought Policy Commission. The Commission is composed of fifteen members - representative of all levels of government and other drought impacted groups – and is charged by Congress to provide advice and recommendations on the creation of an integrated, coordinated Federal policy for drought emergencies. On May 17, 2000, the Commission provided its findings and recommendations to Congress and published the report “Preparing for Drought in the 21<sup>st</sup> Century”. The Report outlines a national drought policy statement developed by the Commission with preparedness as its foundation. The Report establishes five broad goals and a number of specific recommendations under each. The Commission intends to achieve the goals in the coming years through a combination of legislation, planning, coordination of programs, public/private collaborative partnerships, and public education.

U.S. Army Corp of Engineers

The U.S. Army Corp of Engineers (USACE) Institute for Water Resources developed and maintains the National Drought Atlas, which provides information on the magnitude and frequency of minimum precipitation and stream flow in the United States (two important indices of drought).

U.S. Geological Survey

The U.S. Geological Survey (USGS) is the primary federal agency that collects and analyzes streamflow data, another good index of the relative severity of drought. The USGS Hydro-Climatic Data Network is composed of 1,659 streamflow stations in all 50 states and U.S. Territories. These stations have recorded streamflows for 20 years or more. The USGS, in cooperation with over 600 other government agencies, operates some 7,300 stream gauges for data collection. In addition to streamflow data, the USGS collects data on water quality, reservoir levels and contents, and groundwater levels for each state. For Michigan, this data can be found in the annual Water Source for Michigan document.

### National Weather Service

The National Weather Service (NWS) is the primary Federal agency that collects and publishes precipitation data. The NWS publishes data from approximately 9,100 non-recording and 2,100 recording stations in the United States. This data is published monthly, by state, in the Climatological Data and Hourly Precipitation Data. A drop from normal precipitation levels is a commonly used index to determine drought severity.

### U.S. Department of Agriculture

The U.S. Department of Agriculture (USDA) has a variety of programs designed to provide federal assistance to farmers and other agricultural enterprises that have suffered a loss due to a natural disaster – including drought. Some assistance programs require that either the President of the United States or Secretary of Agriculture make a disaster declaration before assistance is made available. The USDA Farm Service Agency (FSA) can provide emergency loans to farmers, ranchers, and agriculture operators under one or more of the following programs:

- The Emergency Conservation Program (ECP)  
The ECP shares with agricultural producers the cost of rehabilitating eligible farmlands damaged by natural disaster. During severe drought, ECP also provides emergency water assistance, both for livestock and for existing irrigation systems for orchards and vineyards. ECP assistance may be made available without a Presidential or Secretarial emergency disaster designation.
- Emergency Loan Assistance (EM)  
Low interest EM loan assistance is provided to eligible farmers to help cover production and physical losses in counties declared a disaster by the President or designated by the Secretary of Agriculture. The FSA Administrator may also authorize EM loan assistance to cover physical losses.
- Emergency Haying and Grazing Assistance  
Emergency haying and grazing of certain Conservation Reserve Program acreage may be made available in areas suffering from weather-related disaster. Requests for assistance are granted on a county-by-county basis. If approved, harvesting of hay and/or livestock grazing is allowed on cropland that has been removed from production in annual crop programs.

In some instances, farmers affected by disaster in counties contiguous to areas that have received a Presidential disaster declaration, or those that have been specifically designated in a Secretary of Agriculture Disaster declaration, may also qualify for assistance.

In addition to the FSA, the USDA Natural Resources Conservation Service (NRCS) can also provide technical and financial assistance to farmers and agriculture operators for land and water conservation-related efforts aimed at recovering from the adverse impacts of drought and other natural disasters.

### National Drought Mitigation Center

The National Drought Mitigation Center (NDMC), located at the University of Nebraska-Lincoln, is a major research and information center with the mission to help people and institutions in the United States develop and implement measures to reduce communities' vulnerability to drought. The NDMC, through its various programs and initiatives, stresses prevention and risk management rather than crisis management. The NDMC builds on the work of the International Drought Information Center (IDIC), also at the University of Nebraska-Lincoln, which takes a worldwide perspective in its research and mitigation work related to the hazard of drought. The NDMC and IDIC are both clearinghouses for drought-related research studies, policy and planning assistance, training and educational initiatives, and information sharing. These organizations are the worldwide coordinating points for drought-related programs and initiatives.

### State of Michigan

In Michigan, drought identification and monitoring are a multi-agency collaborative effort that may involve the departments of Agriculture, Environmental Quality, Natural Resources, Community Health, and State Police Emergency Management Division. When a drought occurs in Michigan, other agencies, such as the Office of Services to the Aging and the Family Independence Agency, may also become involved to monitor the impact of the drought conditions on individuals and families. Depending on the nature and extent of the situation, a state-level task force may be set up to promote cooperation, coordination, and good information flow among participating agencies. In extreme cases, the State Emergency Operations Center may be activated and staffed for the duration of the event.

### Drought Overview

Because Arenac County consists of 60% forests, the biggest problem drought presents are the increased threat of wildfire. A drought impacted landscape could quickly turn a small fire into a raging out of control blaze. Wildfires could destroy homes, businesses, and other property located in the County's rural residential areas.

A drought could also impact the agricultural areas of the County. A drought could alter the quantity and quality of crops, livestock and other agricultural activities, resulting in severe economic and social hardships throughout the County.

### **Public Health Emergencies**

A widespread or severe epidemic, incident of contamination, or other situation that presents a danger to, or otherwise negatively affects, the general health and well-being of the public.

### Hazard Description

Public health emergencies can take many forms – disease epidemics, large-scale incidents of food or water contamination, extended periods without adequate water and sewer services, harmful exposure to chemical, radiological or biological agents, and large-scale infestations of disease-carrying insects or rodents among others. Public health emergencies can occur as primary events by themselves, or they may be secondary events to another disaster or emergency such as a flood, tornado, or hazardous material incident. The common characteristic of most public health

emergencies are that they adversely affect, or have the potential to adversely affect, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical or biological agent with the potential to adversely affect a large number of people. Such a release could be an act of sabotage aimed at the government or a specific organization or segment of the population. Fortunately, Michigan has not experienced such a release aimed at mass destruction. However, Michigan has experienced hoaxes and it is probable that an actual incident of that nature or magnitude will occur.

The following information describes some of the more common or serious pathogenic illnesses that possibly could develop into a public health emergency in Arenac County.

### Food-borne Illness

There are approximately 250 known food-borne illnesses. They can be caused by many different bacteria, viruses, parasites, and natural or man-made chemicals. People contract these agents by the ingestion of contaminated food with, or without, subsequent spread from person to person by the fecal-oral route. Below are just a few of the more common food-borne illnesses that have the potential to result in a wide-spread outbreak.

### Salmonellas

Salmonellas is a bacterial infection from the Salmonella bacteria. The Salmonella germ is actually a group of bacteria that can cause diarrhea illnesses in humans. Every year, approximately 40,000 cases of salmonellas are reported in the United States. Because many mild cases are not diagnosed or reported, the actual number of infections may be much greater. National medical costs and lost wages associated with this illness have been estimated to be \$1 billion per year.

Salmonellas is more common in the summer than winter. Children are the most likely to get salmonellas, and young children, the elderly, and the immune-compromised are the most likely to have severe infections. It is estimated that approximately 1,000 people die each year from acute salmonellas. Most people infected with Salmonella develop diarrhea, fever, and abdominal cramps within 12 to 72 hours after ingestion of contaminated matter. The illness usually lasts 4 to 7 days, and most people recover without treatment. However, for some people the diarrhea may be so severe that the patient must be hospitalized. In these patients, the Salmonella infection may spread from the intestines to the blood stream, and then to other parts of the body and can cause death unless the person is treated promptly with antibiotics.

Salmonella lives in the intestinal tracts of humans and other animals. Salmonella is usually transmitted to humans by eating food contaminated with animal feces. Contaminated foods typically are animal products, such as beef, poultry, milk, or eggs, but all foods may become contaminated. Raw foods of animal origin are frequently contaminated, but thorough cooking kills the bacteria. Food may also become contaminated by the hands of an infected food handler. Salmonella may also be spread by pets especially those with diarrhea. Reptiles are particularly likely to harbor Salmonella

and people should always wash their hands immediately after handling a reptile, even if the reptile appears healthy.

#### Escheria coli 0157:H7 (E coli)

Escherichia coli 0157:H7, commonly known as E. coli, is a relatively new cause of food-borne illness. An estimated 10,000 to 20,000 cases of E. coli infection occur in the United States each year. Infection often leads to bloody diarrhea, and occasionally, to kidney failure.

Most illness has been associated with eating undercooked, contaminated ground beef. Infection can also occur after drinking unpasteurized milk, or from swimming in, or drinking, sewage- contaminated water. Because E. coli bacteria are present in the stool of those infected, person-to- person contact in families and childcare centers is another possible mode of transmission. Although the number or organisms required to cause illness is not known, it is suspected to be very small.

Meat can become contaminated with E. coli during slaughter, and organisms can be thoroughly mixed into beef when it is ground. Bacteria present on the cow's udders or on equipment may get into raw milk. Because the organism lives in the intestines of healthy cattle, preventive measures on cattle farms and during meat processing are being investigated.

Young children typically shed the organism in their feces for a week or two after their illness subsides. E coli infection often causes severe bloody diarrhea and abdominal cramps; however sometimes the infection causes non-bloody diarrhea or no symptoms. Usually little or no fever is present, and the illness resolves in 5 to 10 days.

In some people, especially children under 5 years old and the elderly, the infection can cause a complication called hemolytic uremic syndrome, in which the red blood cells are destroyed and the kidneys fail. About 2 to 7 percent of E. coli infections lead to this complication. In the United States, hemolytic uremic syndrome is the principal cause of acute kidney failure in children, and most cases of hemolytic uremic syndrome are caused by E. coli.

People can help prevent E. coli infection by thoroughly cooking ground beef, avoiding unpasteurized milk, and washing hands carefully.

#### Listeriosis

Listeriosis, a serious infection caused by eating food contaminated with the bacterium *Listeria monocytogenes*, has recently been identified as an important public health problem in the United States. Each year, an estimated 1,100 people in the United States become seriously ill with listeriosis. Of the ill, approximately 250 die. The disease affects primarily pregnant women, newborns, and adults with weakened immune systems. Babies can be born with listeriosis if their mothers eat contaminated food during pregnancy. Healthy adults and children occasionally may consume contaminated foods and get infected with *Listeria*, but they rarely become seriously ill.

*Listeria monocytogenes* is found in soil and water. Vegetables can become contaminated from the soil or from manure used as fertilizer. Animals can carry the bacterium without appearing ill and can



contaminate foods such as meats and dairy products. The bacterium has been found in a variety of raw foods, such as uncooked meats and vegetables, as well as in processed foods that become contaminated after processing, such as soft cheeses and cold cuts. Unpasteurized milk or foods made from raw milk may contain the bacterium.

Listeria is killed by pasteurization, and other heating procedures used to prepare ready-to-eat processed meats should be sufficient to kill the bacterium; however, unless good manufacturing practices are followed, contamination can occur after processing. People at risk can prevent Listeria infection by avoiding certain high-risk foods and by handling food properly.

### Botulism

Botulism is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. In the United States an average of 110 cases of botulism are reported each year. Of these, approximately 25 percent are food-borne. Food-borne botulism is caused by eating foods that contain the botulism toxin. All forms of botulism can be fatal and are considered medical emergencies. Food-borne botulism can be especially dangerous because many people can be poisoned by eating a contaminated food. Because the amount of toxin required to paralyze a person is so low, the potential for a very large-scale botulism outbreak always exists.

Outbreaks of food-borne botulism involving two or more people occur almost every year, and usually are caused by eating contaminated home-canned foods. In 1977, one of the largest outbreaks of food-borne botulism ever to occur in North America was linked to home canned jalapeno peppers served by an Oakland County restaurant. Reportedly 59 people became ill from the peppers; many of these people required intensive care treatment and the horse serum botulism antitoxin.

### Hepatitis A

Hepatitis A is a virus that harms the liver and causes fever, loss of appetite, nausea, abdominal pain, and jaundice. It is transmitted through the fecal/oral route or by consuming food or water contaminated by an infected food handler. Hepatitis A infection is usually a mild and self-limiting illness. It is rarely fatal and can be prevented through post-exposure immune globulin or by pre-exposure vaccination.

Hepatitis A can occur in situations ranging from isolated cases to widespread epidemics. Nationally, it is estimated that there are between 125,000 and 200,000 infections per year.

In the spring of 1997, an outbreak of almost 300 cases of hepatitis A occurred in at least four Michigan school districts. An epidemiological investigation linked the outbreak to contaminated frozen strawberries distributed through the national school lunch program.

### Arthropod-borne Illness

Arthropod-borne illnesses are those caused by viruses that are transmitted between susceptible vertebrate hosts (people, birds, and other animals) by blood feeding arthropods, such as mosquitoes and ticks.

### Encephalitis

Encephalitis is an illness characterized by the swelling of the brain. An outbreak of the West Nile encephalitis had never before been reported in the Western Hemisphere until an outbreak in St. Louis, Missouri in 1933 with over 1,000 cases reported to local health departments. Birds were believed to be the carriers of this strain of encephalitis. The virus was transmitted to humans by mosquitoes that had previously fed on the infected birds. However, there is no evidence that a person can get the virus from handling live or dead infected birds. Although this outbreak was localized in New York, given the mobility of humans and birds, it had the potential to be transported to other regions of the country.

St. Louis encephalitis is a more common strain of encephalitis in the United States. Since 1964 there have been 4,478 reported human cases of St. Louis encephalitis, with an average of 128 cases reported annually.

Mild encephalitis infections are most common and include fever, headache, and body aches, often with skin rash and swollen lymph glands. More severe infection is characterized by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, paralysis, and on rare occasions, death.

The risk of these and other arthropod-borne illnesses is greatly reduced by the effectiveness of mosquito control and public education programs.

### Water-borne Illnesses

#### Cryptosporidiosis

Cryptosporidiosis is contamination by a microscopic parasite *Cryptosporidium* that can live in the intestines of humans and animals. This parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very resistant to chlorine disinfection. Normally, healthy people can effectively fight the parasite on their own and have no symptoms. However, for people with preexisting health conditions, infection with *Cryptosporidium* can be life threatening.

Cryptosporidiosis is present in approximately 97 percent of surface water, and 39 percent of drinking water supplies in the United States. Cryptosporidiosis can be contracted by ingesting anything that has come in contact with the stool of a person or animal with the parasite. This includes swallowing water from swimming pools, hot tubs, Jacuzzis, lakes, rivers, springs, ponds, or streams contaminated with sewage or feces from humans or animals, or by eating uncooked food contaminated with *Cryptosporidium*.

Symptoms of cryptosporidiosis generally begin 2 to 10 days after being infected and include diarrhea, stomach cramps, upset stomach, and a slight fever. These symptoms tend to last about 2 weeks. Once the symptoms are gone, a carrier continues to pass *Cryptosporidium* in his stool for up to 2 months. During this 2-month period, the infection can spread to others. People should avoid swimming in pools for at least 2 weeks after the symptoms stop if they have had cryptosporidiosis.

Infected swimmers have caused several outbreaks of cryptosporidiosis among pool users because the parasite can survive in chlorinated pools for several days.

To prevent the spread of *Cryptosporidium*, hands should be washed with soap and water after using the toilet, changing diapers, and before eating or preparing food. Also, avoid water or food that may be contaminated: this includes avoiding drinking water from lakes, rivers, springs, ponds, or streams unless it has been filtered and chemically treated. During community-wide outbreaks caused by contaminated drinking water, boil drinking water for one minute to kill the *Cryptosporidium* parasite and make the water safe to drink.

A severe *Cryptosporidium* outbreak occurred in Milwaukee, Wisconsin in April of 1993. On April 5, thousands of city residents suddenly became ill with a gastrointestinal disorder. Follow-up investigations identified the largest water-borne disease outbreak in U.S. history as being caused by *Cryptosporidium* in the city's water supply. Engineering studies indicated the need for more than \$90 million in improvements to Milwaukee's water supply and treatment system. During this outbreak, more than 400,000 people were infected with the parasite, and over 4,000 victims required hospitalization. In addition, over 100 people in the Milwaukee area with compromised immune systems are believed to have died prematurely after being infected with *Cryptosporidium* during the outbreak.

### Other Communicable Diseases

#### Influenza

Influenza, commonly called "the flu", is caused by viruses, which infect the respiratory tract. The virus is typically spread from person-to-person when an infected person coughs or sneezes the virus into the air. Compared with other viral respiratory infections such as the common cold, influenza infection can cause severe illness and also precipitate life-threatening complications in all age groups. Flu is a major cause of sickness and death in the U.S., leading to approximately 20,000 deaths and more than 110,000 hospitalizations each year. During a typical flu season in Michigan, 200 to 500 people will die from flu related illness.

Typical symptoms of flu include fever, dry cough, sore throat, runny or stuffy nose, headache, muscle aches, and extreme fatigue. Children may experience nausea, vomiting, and diarrhea, but these symptoms are not common in adults. Some medical complications brought on by flu include bacterial pneumonia, dehydration, and worsening of preexisting chronic conditions, such as congestive heart failure and asthma. Complications occur most often in people who are elderly or people who suffer from chronic health conditions.

In the United States, flu outbreaks typically occur during the winter months from late December through March. The start, peak period, duration and total hospitalizations and deaths of a flu season vary considerably from year to year.

The most important preventive measure against the flu is for individuals, especially those at risk for complications, to get vaccinated in the fall prior to the onset of flu season. The effectiveness of the flu vaccine in protecting individuals against illness depends on primarily:

1. The age and physical condition of the person receiving the vaccine.
2. The similarity or “match” between the virus strains in the vaccine and those in circulation.

When the “match” between vaccine and circulating, strain is close, the flu vaccine prevents illness in 70 to 90 percent of healthy people younger than age 65.

#### Public Health Emergencies in Arenac County

There have been no significant public health emergencies in Arenac County.

#### Public Health Programs

The Michigan Department of Community Health, local, and district health departments across the state have a number of programs and initiatives in place to protect the health, safety and well-being of Michigan’s residents. These programs and initiatives, such as providing immunizations, have been very successful in limiting the scope and magnitude of the types of public health emergencies described above. However, because the nature of the threats to our public health is always changing, and because the population is becoming larger and more mobile, the possibility always exists for a local, regional or statewide public health emergency to occur.

The Director of the Department of Community Health, and local public health officers, have the authority (under the Michigan Public Health Code) to take those steps deemed necessary and prudent to prevent epidemics and the spread of hazardous communicable diseases, or to effectively mitigate other conditions or practices that constitute a menace to public health. The Director and local public health officers can issue written orders to that effect, and those orders can be enforced through the imposition of civil and criminal penalties for failure to comply.

At the national level, the U.S. Centers for Disease Control and Prevention (CDC), a branch of the Department of Health and Human Services, has the responsibility and authority to investigate public health emergencies to determine their cause, probable extent of impact, and appropriate mitigative measures. The CDC can also assist state and local public health officials in establishing health surveillance and monitoring programs, and in disseminating information on prevention and treatment to the general public.

One example of a CDC program is PulseNet. In 1998 the CDC launched this collaborative interagency initiative that uses DNA fingerprinting to better detect food-borne illness. With this program, more than 35 laboratories across the country can identify E. coli in less than 24 hours. This identification process used to take days or weeks.

### Water Distribution Systems

Michigan's public water supplies are regulated under the Federal Safe Drinking Water Act through the Michigan Safe Drinking Water Act (399 P.A. 1976). The Michigan Department of Environmental Quality (DEQ) provides supervision and control of Michigan's public water supplies (including their operation and physical improvements).

The DEQ Drinking Water and Radiological Protection Division regulates, through a permit process, the design, construction and alteration of public water supply systems. Water supply construction must be conducted within the framework of the Michigan Safe Drinking Water Act, as well as the Architecture, Professional Engineering and Land Surveying Act (240 P.A. 1937). Most communities in Michigan have, in conjunction with the DEQ, developed water system master plans that conform to the requirements of the Michigan Safe Drinking Water Act. From a hazard mitigation standpoint, that is important because it helps ensure that all new water system construction and alterations to existing systems will conform to the minimum standards set in the Act.

### Wastewater Collection/Treatment Systems

The Federal Clean Water Act regulates the discharge from community wastewater collection and treatment systems. The regulatory aspects of the Act that pertain to municipalities have been delegated to the DEQ Surface Water Quality Division for surface water discharge facilities, and the DEQ Waste Management Division for groundwater discharge facilities. Authority for the oversight of planning, facility design review, and construction permitting of sewerage systems collection, transportation and treatment facilities, is derived from Part 41 of the Michigan Natural Resources and Environmental Protection Act (451 P. A. 1994) and Administrative Rules promulgated under authority of Part 41. The two DEQ divisions assist communities with the development and maintenance of their wastewater collection and treatment systems. In addition, they monitor and regulate these systems to ensure pollution abatement and health conditions are met. The regulatory authority vested in the DEQ is primarily aimed at preventing pollution of waters of the state. An effective wastewater treatment system helps to ensure that people in Michigan will not contract illnesses from contaminated waters.

### Michigan Unified Food Law (92 P.A. 2000)

Michigan's Unified Food Law went into effect November 8, 2000. The law was enacted to modernize, standardize, and consolidate Michigan's food laws while adopting the U.S. Food and Drug Administration's (FDA) 1999 Food Code as a uniform regulatory standard for retail food establishments such as restaurants, other food service facilities, groceries and convenience stores. The law will help in protecting Michigan consumers from serious foodborne illnesses such as E. coli, salmonella, listeriosis, botulism, and hepatitis.

### U.S. Food and Drug Administration Food Code

The U.S. Food and Drug Administration (FDA) Food Code is the national regulatory standard for retail food establishments. The FDA Food Code is neither Federal law nor Federal regulation but represents the FDA's best advice for a uniform system of regulation to ensure that food at retail establishments is safe and properly protected and presented. It may be adopted and used by agencies at all levels of government that have responsibility for managing food safety risks at the

retail level. The Food Code provides practical, science-based advice and manageable provisions for mitigating risk factors known to contribute to food borne illnesses. The FDA Food Code is revised every two years.

Michigan adopted the 1999 FDA Food Code in the Michigan Unified Food Law of 2000 – 92 P.A. 2000.

#### U.S. Centers for Disease Control and Prevention

At the national level, the U.S. Centers for Disease Control and Prevention (CDC), a branch of the Department of Health and Human Services located in Atlanta, Georgia, has the responsibility and authority to investigate public health emergencies to determine their causes, probable extent of impact, and appropriate mitigation measures. The CDC can also assist state and local public health officials in establishing health surveillance and monitoring systems/programs, and in disseminating information on prevention and treatment to the general public. The CDC has dedicated funding for bioterrorism response. Michigan will be strengthening its surveillance and intervention infrastructures with these funds.

#### Public Health Emergencies Overview

The Central Michigan District Health Department offers influenza vaccines yearly. Arenac County residents may receive these vaccines at the local health department. The vaccines are also offered at various other locations throughout the County.

Annually the Environmental Health Sanitarians inspect restaurants, public swimming pools and campgrounds. These inspections ensure that the establishments are complying with health and safety standards. Business establishments are given a certain amount of time to correct these violations if found in violation of any health hazards. In some cases, if there are too many serious violations, the establishments may be ordered to close until they are in compliance.

### **Scrap Tire Fires**

Scrap tire fires are an instance of uncontrolled burning at a scrap tire storage recycling site.

#### Hazard Description

With the disposal of an estimated 250 million vehicle tires annually in the United States, management of scrap tires has become a major economic and environmental issue. Michigan generates some 7.5 to 9 million scrap tires each year. Although responsible means of disposal have become more common, tire dumps of the last fifty years present environmental and safety hazards that will last into the foreseeable future. The State of Michigan has identified a total more than 23 million scrap tires in disposal sites scattered around the state.

Issues pertaining to the management of scrap tire disposal sites are difficult and diverse. Whole tires are difficult to landfill because they tend to float to the surface. Whole tires are banned by many licensed landfills due to associated problems. In addition, scrap tires are breeding grounds for mosquitoes, which can reproduce at 4,000 times their natural rate in a scrap tire disposal site. From an emergency management perspective, the most serious problem that scrap tire disposal sites pose is that they can be a tremendous fire hazard if not properly designed and managed.

Tire disposal sites can be fire hazards due to the large number of tires typically present at a site. This large quantity of “fuel”, coupled with the fact that the shape of a tire allows air to flow into the interior of a large tire pile, renders standard firefighting practices nearly useless. Flowing burning oil released by the tires spreads the fire to adjacent areas. Some scrap tire fires have burned for months, creating acrid smoke and an oily residue that can leach into the soil, creating long-term environmental problems.

Scrap tire fires differ from conventional fires in several respects: 1) even relatively small scrap tire fires can require significant resources to control and extinguish; 2) the costs of fire management are often far beyond that which a local government can absorb; 3) the environmental consequences of a major tire fire are significant; and 4) as alluded to earlier, the extreme heat converts a standard passenger vehicle tire into about two gallons of oily residue, which can leach into the soil or migrate to streams.

Current technologies are sufficient to address the reuse of newly generated scrap tires, but some waste tires still migrate to the least expensive disposal method, which usually means they end up in a scrap tire disposal site (sometimes illegally).

### Existing Prevention Programs

The Scrap Tire Regulatory Program is implemented by the Waste Management Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A., 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program. The goal of the program is to promote development of an acceptable scrap tire management system which minimizes environmental, public health, and nuisance concerns, and maximizes the resource recovery of scrap tire materials. To accomplish this, the following were initiated:

1. A compliance and enforcement program were implemented.
2. A scrap tire policy recycling hierarchy was established.
3. Special uses of scrap tires were approved.
4. A grant program was established to address abandoned tires.

In 1997, Part 169 was amended to require that a statewide emergency response plan be put into place to address response to fires at collection. Also, addressed in the legislation were:

1. Increased scrap tire regulations – including fire lane widening from 20 to 30 feet.
2. Minimum bonding requirements for all scrap tire storage sites.
3. Authorization of local fire department inspections of storage/disposal sites.

### Scrap Tire Management

To be effective, scrap tire management must be viewed from two perspectives. First, methods for dealing with the millions of scrap tires currently being generated must be devised to stop the problem from growing in scope and magnitude. Recycling and re-use appear to be the best options in that regard. Second, measures must be devised to address the issues pertaining to the millions of

scrap tires already present in existing disposal sites. In developing such a corrective solution, the economic realities of the problem must be understood.

The vast majority of disposal site owners have neither the financial means nor the incentive to address the health and fire hazards that result from the storage of scrap tires on their property. Unless the value of the tires increases dramatically through technological development (an unlikely situation in the foreseeable future), the piles will continue to grow, exacerbating the health and safety hazards for surrounding communities.

#### Mitigation of Scrap Tire Fires

To combat these problems at current disposal sites, suggestions have been made about establishing a state policy and program for acquiring such sites and suitably disposing of the millions of tires at these locations. Other proposals call for educating local jurisdictions on the hazards associated with scrap tire disposal sites so that enforcement of existing legislation is effective in minimizing future potential scrap tire fires.

In January 2000, \$580,000 in state grants was made available to 12 applicants to help clean up over 420,000 scrap tires at major disposal sites across the state. The grants were provided under the authority of Part 169, Scrap Tires, of the Natural Resources and Environmental Protection Act (1994 P.A. 451), as amended. Sites with abandoned scrap tires and collection sites where tires were accumulated prior to January 1, 1991 were eligible to apply for the funds. The grants will help reduce the potential public health and environmental concerns (i.e., fire and mosquitoes) associated with the largest of the sites, some of which contain from 50,000 to 750,000 scrap tires.



### Scrap Tire Fire Statewide Response Plan

To comply with the amendments to Section 169 of the Natural Resources and Environmental Protection Act, the State of Michigan has developed a statewide response plan for large scrap tire fires. This plan, which was written by the Michigan Department of Environmental Quality with input from the Michigan State Police and the Michigan Association of Fire Chiefs, establishes a framework for planning, preparedness and response measures for large scrap tire fires. While this plan will certainly not stop scrap tire fires from occurring, it is hoped that the plan will at least keep the problem in check until more permanent hazard mitigation measures can be instituted to reduce the threat of tire fires across Michigan.

### Scrap Tire Fire Overview

Even with the improvements to the State's regulatory authority brought about by the recent legislative changes, much work still needs to be done to mitigate the impacts of scrap tire fires. Incident management planning, recognition of the hazardous material potential of fires at scrap tire sites and improving/enhancing disposal site selection and design processes are all critical pre-incident preparedness factors that must be addressed by government and the private sector. In light of the potential consequences of scrap tire fires, prevention must become a primary goal in the treatment of scrap tire disposal sites.

Although the estimated 17,000 scrap tires in Arenac County cannot be ignored as a threat, it is doubtful a scrap tire fire in itself could cause a severe emergency or disaster. In Arenac County, scrap tires are more likely to add problems to an already existing fire. In the past, all scrap tire fires in Arenac County have been managed by local fire fighters. Arenac County participates in the program and has collected scrap tires annually.

### **Hazardous Material Incidents - Fixed Site**

A hazardous material incident is an uncontrolled release of hazardous materials from a fixed site, capable of posing a risk to health, safety, property, and to the environment. Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, pose a potential threat to life, health, property and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

Hazardous materials are highly regulated by the government to reduce risk to the general public, property, and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use and disposal of these materials, accidental releases do occur. Areas at most risk are within a 1-5-mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but release can still cause severe harm to people, property, and the environment if proper mitigation action is not taken in a timely manner.

The world's deadliest hazardous material incident occurred on December 4<sup>th</sup>, 1984 in Bhopal, India. A cloud of methyl isocyanate gas, an extremely toxic chemical, escaped from a Union Carbide chemical

plant, killing 2,500 people and injuring tens of thousands more. This incident triggered historical Federal legislation intended to minimize such disasters from occurring in the United States.

There are currently three sites in Arenac County designated SARA Title III, Section 302 Sites (See map below). These sites are required to have an emergency plan on file with the local Emergency Planning Committee, Fire Department, and at their facilities. All three 302 Sites in Arenac County have an emergency plan on file with the Local Emergency Planning Committee and with their individual Fire Departments.

302 Sites: (Buffer Zones for 302 Sites are half-mile radius)

### Arenac County 302 Sites

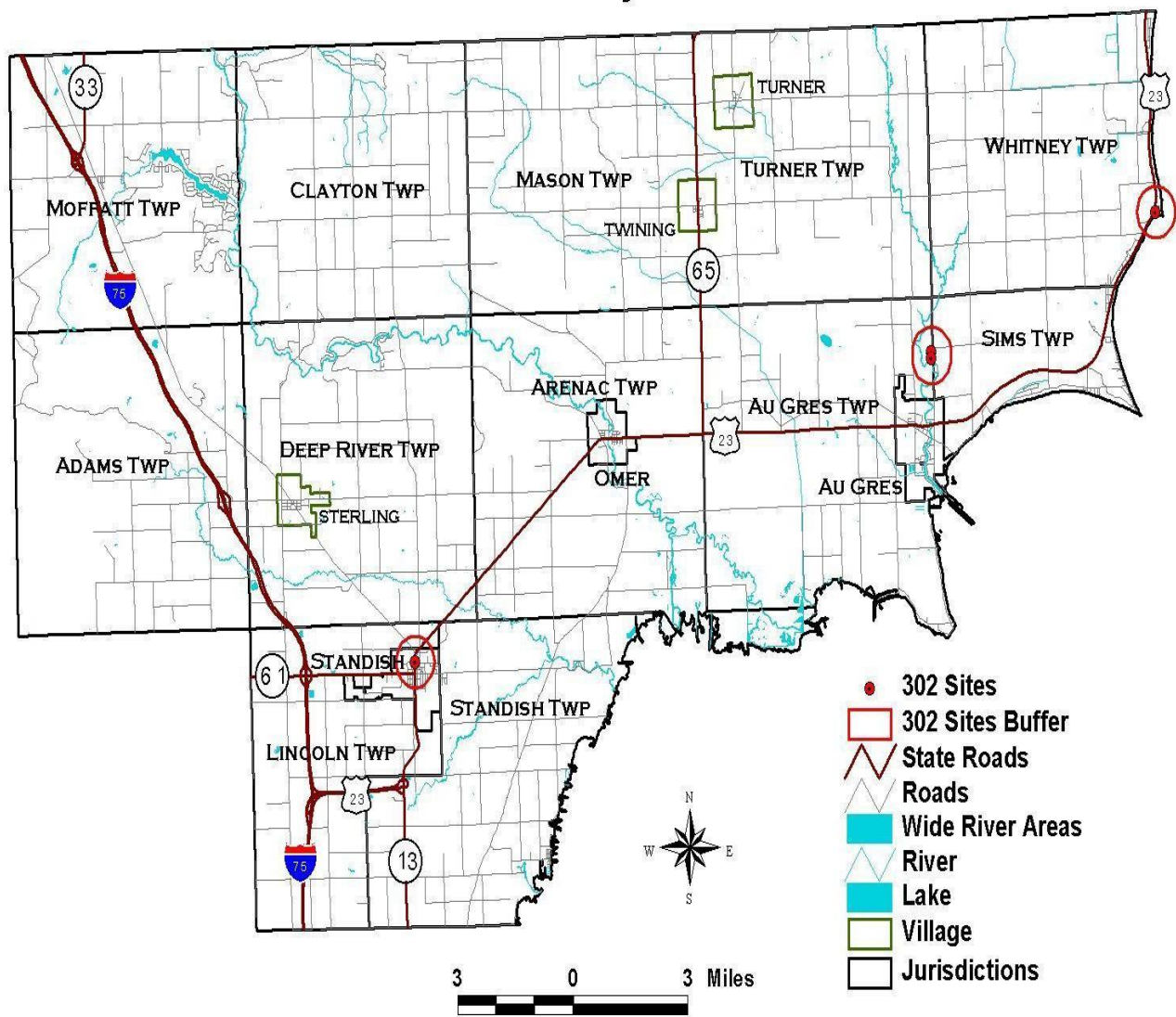


Figure 62

### Standish 302 Sites

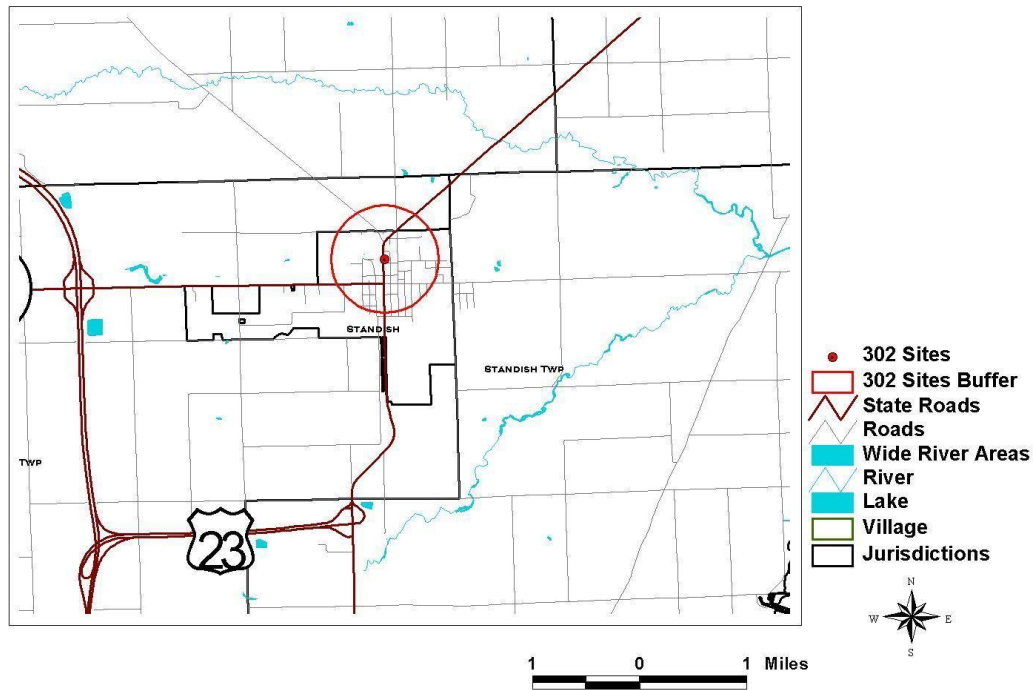


Figure 63

### Au Gres Area 302 Sites

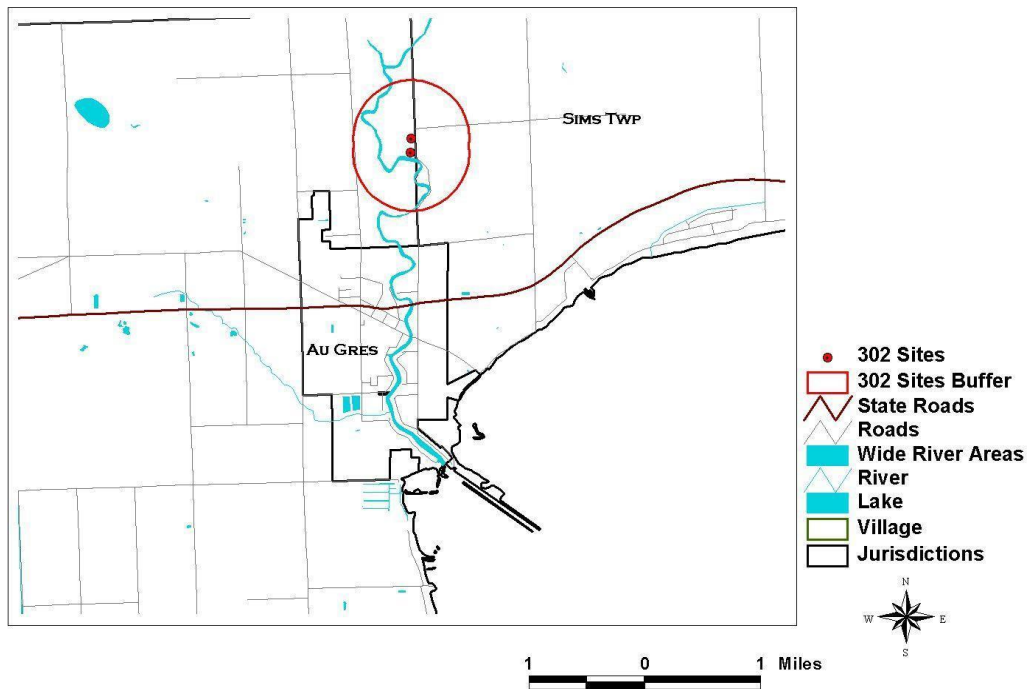


Figure 64

### Whitney Township 302 Sites

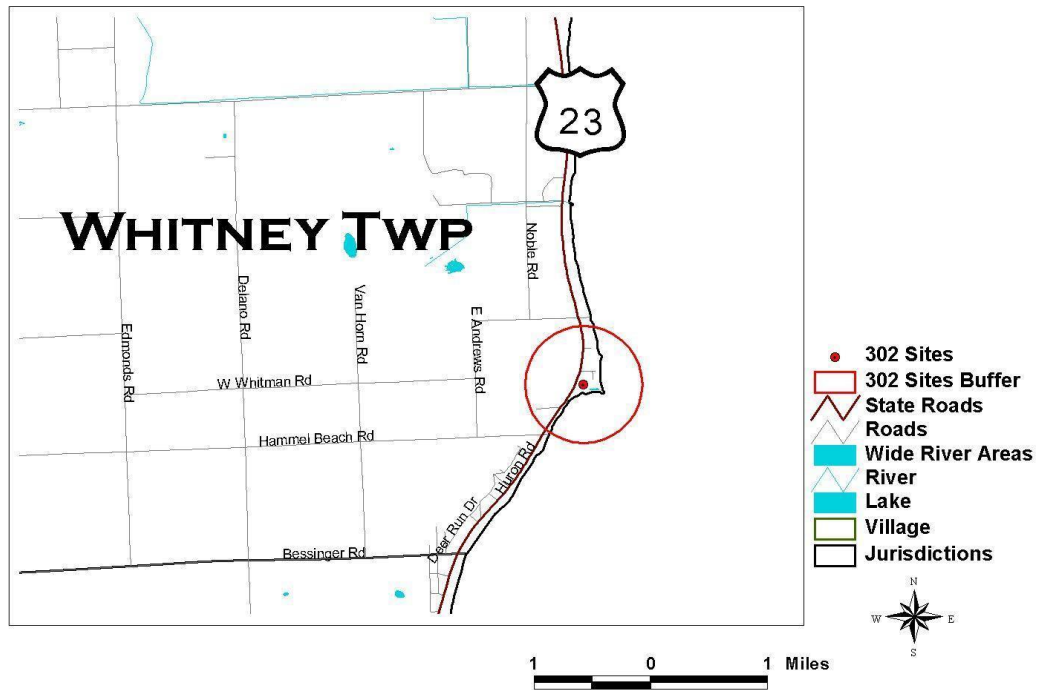


Figure 65

## Community Vulnerability and Risk Assessment

### Arenac County Local Jurisdictional Hazards

Arenac County is located in East Central Michigan on the Saginaw Bay. The County encompasses approximately 367 square miles or approximately 235,136 acres. The county is composed of 12 townships, three cities, and three villages. The City of Standish is the county seat. The county population is 15,070 as of the 2019 US Census Bureau.

All townships, villages, and cities have their own land uses/zoning ordinances except Adams Township.

Potential Natural Hazards: Hail, Lightning, Severe Winds, Tornadoes, Winter Weather Hazards, Ice Storms, Extreme Temps, Riverine Flooding, Wildfire, Drought, Public Health Emergencies

Potential Technological Hazards: Dam Failure, Structural Fire, Transportation Accidents, Hazardous Materials Fixed Site and Transportation, Infrastructure Failures, Oil/Gas Well Incidents, Pipeline Accidents, Drug Labs, Cyberattack

## Arenac County Hazard Mitigation Municipal Questionnaire 2016-2017

In the winter of 2016-17 a survey presented and completed with the townships and cities of Arenac County to gather pertinent information for hazard mitigation planning. The questions asked were to ascertain what their seasonal population shifts are and how they rate natural hazards in their communities. A majority of the communities responded.

Half of the communities feel that they have large seasonal shift in population during the spring, summer, and fall months. The other half of the communities feel they do not have a notable shift in population during these months. Most seasonal shifts were due to “snowbirds” returning in the spring, camping, water sports, and deer season. Estimates of increases in seasonal populations ranged from 5% to 50%. About one-third of the communities indicated that they have a significant number of seasonal homes. Almost all of the communities indicated large numbers of people only traveled through the county for camping, fishing, hunting, and traveling on major highways in the county.

Most communities listed events that draw large numbers of people. The City of Omer has mud bogs and a sucker festival and fish run. The City of Au Gres has fishing tournaments, a car show, fishing tournaments, and county fireworks. Lincoln Township hosts ball tournaments daily in the summer (May-August) bringing over 100 people to the area. Standish Township indicates that the casino and the Pow Wow held their draws a high attendance in the summer. Forest Lake Music Festival and summer picnic draw hundreds of people to their community.

In terms of natural hazards, the communities rated the hazards from one to ten, one being a low threat and ten being a high threat. The following are the averages of their responses:

Wildfire 5  
Tornado 8  
Flood 5  
Severe Wind 7  
Winter Weather 6  
Thunderstorms 7  
Earthquakes 1  
Drought 3  
Extreme Temperatures 5

The communities rated technological hazards also from one to ten. The averages of their responses are:

Public Health Emergency 3  
Structural Fire 4  
Oil and Gas Accident 7  
Civil Disturbance 2  
Infrastructure Failure 5



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Dam Failure 5

Hazard Material Incidents 7

Air, Land, or Water Transportation Accidents 7

Terrorism/Sabotage 2

The communities were asked to give the types of hazards they thought they were least prepared for and why. The primary hazards the communities thought they were least prepared for were transportation of hazardous materials, infrastructure failures, hazardous material accidents, terrorist acts and sabotage, and large forest fires.

The communities' feel they are best prepared for fires and tornadoes, noting that the local fire departments are very good. All communities felt they were best prepared for fires. They all indicated having good fire departments and aid from surrounding communities. (Please see the complete survey responses in appendices for details.)

Over the past decade, there has been little change in the development patterns of Arenac County communities, except for the Saginaw Bay Chippewa Indian Tribe developments in Standish Township. Because of the economic recession of 2008-2009, new construction and other re-development slowed dramatically but is now beginning to recover. Communities have not changed their zoning or other ordinances significantly as many were revised in the 2000's. The Tribe has built its own public safety department to serve its community and commercial interest and cooperates with county and local departments as well as contributing financial support to these entities.

To assure the Arenac County Hazard Mitigation Plan has an accurate and thorough Hazard Analysis and Vulnerability Assessment, which included all local jurisdictions within Arenac County, Emergency Management Coordinator Edward Rohn attended various meetings of all local village, city and townships as well as Arenac County Chapter of the Michigan Township Association. At these meetings the Emergency Management Coordinator facilitated identifying and ranking hazards identified by the local officials who were unable to attend the Arenac County LEPC/LPT Hazard Mitigation planning meetings. This allowed for discussion and rating of the identified local hazards for inclusion in the County Hazard Mitigation Plan.

The results of these local jurisdiction meetings concurred with the overall County results determined by the LEPC/LPT meetings showing Flooding, Public Health Emergency, Transportation Accident and Infrastructure Failure as the top ranked hazards.

These local meetings also revealed a specific concern by some jurisdictions for a unique hazard that affects some local jurisdictions much more severely than the effect on the County as a whole. That hazard risk was identified as Lake Huron shoreline flooding and erosion along the easterly coast of the County due to recent record-breaking lake levels. The National Weather Service predicts these record levels to increase in the immediate future and result in significant future property losses and financial hardship in these areas. Long term planning and immediate response actions have begun and will continue to help mitigate this hazard. All local jurisdictions expressed interest in the opportunity of adopting the approved Hazard Mitigation Plan when adopted by the County of Arenac and requested information of how to proceed with the plan adoption. The draft Hazard Mitigation

Plan adopted by the Arenac County Board of Commissioners was made available electronically to all local units of government and posted on the Arenac County public website. The Arenac County Emergency Management Coordinator is currently arranging meetings with all units of government to discuss the plan and assist them in adopting the plan.





## Chapter 5

## *Hazard Analysis and Vulnerability Assessment*



Arenac County has significant natural, cultural, and economic assets that are at risk to hazards of many kinds. The county is blessed with the bountiful natural resources of the Saginaw Bay, major rivers, and extensive state and national forests. It has numerous cultural assets including the Standish Depot and the Omer & Au Gres Historical Buildings. It has substantial economic assets in manufacturers in Standish and Au Gres. And it has one of Michigan's largest casinos in Standish Township.

The Emergency Management Director and the consultant compared the existing 2005 Arenac County Hazard Mitigation Plan to assess previous conclusions and recommendations of that plan with current assessments. Many of the conclusions are the same but with some striking exceptions. In this plan local communities emphasized regularly occurring natural hazards – severe winds, thunderstorms, winter weather and extreme temperatures as their main concerns. Other technological hazards including oil and gas incidents, hazardous materials, and transportation accidents were of high concern, although a rare occurrence in the county, the highest ranked threat identified by Arenac's communities is tornadoes.

Hazard rankings in the 2005 plan showed sabotage/terrorism as the highest ranked threat, a threat most communities now see as much lower. But most of the common natural hazards, i.e., severe winter weather, thunderstorms, and flooding also ranked high. The previous plan also had many technological threats ranked high – structural fire, hazardous material incidents, and infrastructure failures. The highest threats seen as a concern by communities in this plan also include hazardous material incidents, but they ranked oil and gas incidents and transportation accidents among the highest threats to their communities. Drought and extreme heat were ranked about the same by local communities but the LPT group currently ranks drought and extreme heat as high threats.

The Emergency Management Director met on numerous occasions with representatives of the participating county communities, and the Hazard Mitigation Planning Committee to analyze historic and current risk information. The conclusions of these meetings were reviewed by the Emergency Management Director and the consultants. The review led to concurrence on the most important potential hazards for Arenac County. These hazards were identified in the Risk Analysis as Thunderstorm Hazards, Severe Winter Weather Hazards, Wildfire, Infrastructure Failure, Haz/Mat Transportation, Structural Fire, Oil/Gas Well Accidents, Dam Failure, Sabotage/Terrorism, Transportation Accidents, Petroleum/Natural Gas Pipeline Accidents. These risks have been examined, then reviewed, and the county's vulnerability assessed. As indicated earlier, *predictability* and *mitigation potential* were seen to be able to effect hazard risks in significant ways. These factors, as well as the others determined during the analysis, will be used to prepare the following *Mitigation Strategy*.

## Hazard Analysis

The Risk and Vulnerability Assessments involve estimating the probability of harm and also the severity of harm from each hazard that is possible in a community. Hazards that are considered insignificant can be addressed with merely a cursory analysis. Hazards that have the real potential to cause disruption, damage, harm, or loss of life should be considered significant and should be described fully. The degree of risk should be estimated for significant hazards. There are different ways to measure risk, but available measures can be adjusted to allow them to be compared to each other. For example, many different types of impacts can be represented with a dollar value. FEMA assesses mitigation projects by comparing the cost of the mitigation project with the costs of continuing to endure damages from the hazards being addressed.

In the process of preparing this analysis, the MSP-EMD Pub201A Hazard Analysis Guidance Tool was utilized, however, there have been adjustments to simplify the local planning process. The Local Planning Team and the Hazard Mitigation Planning Committee assessed the risk of potential events and issues based on such criteria as the frequency of such hazards in Michigan, trends, levels of impact, and other elements found below.

This is an all-hazard document dependent on implementation of emergency functions not related to specific hazard response. For example, many flood hazards require similar planning, response, and mitigation measures despite their specific type. Arenac County is a moderate sized jurisdiction, with its population and resources concentrated in villages and cities, creating a need to generalize hazards. Concentrating on the primary local considerations for the entire hazard class allows for a more efficient planning process than otherwise analyzing each individual hazard.

Starting with these basic criteria, through discussion and meetings, the committee decided which hazards were very likely and somewhat likely to affect their communities. The committee decided that Thunderstorm Hazards, Severe Winter Weather Hazards, Wildfires, Infrastructure Failures, Haz/Mat Transportation Accidents, Structural Fires, Oil/Gas Well Accidents, Dam Failures, Sabotage/Terrorism Events, Transportation Accidents, Petroleum/Natural Gas Pipeline Accidents are the hazards that need to be looked at in detail.

An example that demonstrates the difference between the local effect and standard state definition is best represented in the area of transportation accidents and mass casualty incidents. Although the jurisdiction doesn't frequently experience any large bus, airplane, or railway accidents, it frequently experiences small incidents that involve a 75%-100% capability response.

As each hazard is unique in its dynamics, any of the listed hazards can be equally devastating. As such, the hazard rankings are listed for planning purposes only. They are in no way scientific conclusions demonstrating that one hazard should be focused on more than any other. Instead, it is important for the jurisdiction to focus on the most potentially hazardous aspects of the hazard itself. For example, tornadoes occur with minimal warning time but strike a small area. Flooding occurs with a slower time of onset yet affects a larger area. As such, local efforts should be focused on improving tornado warning systems and on flooding mitigation measures and their appropriate implementation.

Our method uses a common set of 12 evaluation measures and 4 corresponding benchmark factors to evaluate each hazard facing the community. The 12 measures are:

- Historical Occurrence
- Seriously Affected Population
- Collateral Damage
- Population Impact (casualties)
- Economic Effects
- Affected Area
- Duration
- Availability of Warnings
- Speed of Onset
- Seasonal Pattern
- Predictability
- Mitigation Potential

Each corresponding benchmark factor has been assigned a specific point value (10, 7, 4 or 1 point) based on each individual factor's relative severity and negative impacts.

### **Historical Occurrence**

Historical occurrence measures the frequency with which a particular hazard occurs in the area. The more frequently a hazard event occurs, the more potential there is for damage and negative impact on the community. The specific benchmark factors used in the historical occurrence analysis are:

**10 points:** Excessive Occurrence, indicating the hazard event is likely to occur 4 or more times per year;

**7 points:** High Occurrence, indicating the hazard event is likely to occur 2-3 times per year;

**4 points:** Medium Occurrence, indicating the hazard event is likely to occur 1 time per year;

**1 point:** Low Occurrence, indicating the hazard event occurs less than once per year.

### **Seriously Affected Population**

Seriously affected population refers to the number of people who can be expected to be directly affected by a particular hazard event, either because they receive physical injury, property damage, economic hardship, or their day-to-day activities are severely disrupted because of severe damage to their community of residence or work. Specific benchmark factors used in the severely affected population impact analysis are:

**10 points:** Significant Population Affected, indicating more than 5,000 people are likely to be affected by the hazard event;

**7 points:** High Population Affected, indicating 1,000 to 5,000 people are likely to be affected by the hazard event;

**4 points:** Medium Population Affected, indicating 100 to 500 people are likely to be affected by the hazard event;

**1 point:** Low Population Affected, indicating fewer than 400 people are likely to be affected by the hazard event.

## Collateral Damage

Collateral Damage refers to the possibility of a particular hazard event causing secondary damage and impacts. For example, blizzards and ice storms cause power outages, which can cause loss of heat, which can lead to hypothermia and possible death or serious injury. Generally, the more collateral damage a hazard event causes, the more serious a threat the hazard is to a community. The specific benchmark factors used in the collateral damage analysis are:

**10 points:** High Possibility, indicating there is a great likelihood (76 % chance or greater) that the hazard event will cause secondary hazard events and damage;

**7 points:** Good Possibility, indicating there is a higher-than-average likelihood (50 to 75 % chance) that the hazard event will cause secondary hazard events and damage;

**4 points:** Some Possibility, indicating there is a less than average likelihood (less than 50 % chance) that a hazard event will cause secondary hazard events and damage;

**1 point:** No Possibility, indicating there is virtually no likelihood (0 % chance) that a particular hazard event will cause secondary hazard events and damage.

## Population Impact

Population impact refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs. Specific benchmark factors used in the population impact analysis are:

**10 points:** High Impact, indicating 10 or more casualties can be expected;

**7 points:** Medium Impact, indicating 6-1 casualties can be expected;

**4 points:** Low Impact, indicating 1-5 casualties can be expected;

**1 point:** No Impact (none), indicating that no casualties can be expected.

## Economic Effects

Economic effects are the monetary damages incurred from a hazard event including both public and private damage. Direct physical damage costs as well as indirect impact costs such as lost business and tax revenue are included as part of the total monetary damages. Specific benchmark factors used in the economic impact analysis are:

**10 points:** Significant Effects, indicating over \$100,000 in monetary damages incurred;

**7 points:** Medium Effects, indicating \$50,000 to \$100,000 in monetary damages incurred;

**4 points:** Low Effects, indicating \$10,000 to \$50,000 in monetary damages incurred;

**1 point:** Minimal Effects, indicating less than \$10,000 in monetary damages incurred.

## Affected Area

Each hazard affects a geographical area. For example, a blizzard might affect the entire area, while a flood might only affect a portion of a community. Although size of the affected area is not always indicative of the destructive potential of the hazard, generally the larger the affected area, the more problematic the hazard event is for a community. The specific benchmark factors used in the affected area analysis are:

**10 points:** Large Area, if a hazard event has the potential to impact 3 or more townships, municipalities, or communities;

**7 points:** Multiple Sites, if the hazard event could impact more than one area within a township or community;

**4 points:** Small Area, if the hazard event could impact 1 or 2 townships or communities;  
**1 point:** Single Site, if the hazard event is likely to only impact a small area within a township or community.

### Duration

Duration refers to the time period the hazard event is actively present and causing damage (often referred to as the “time on the ground”). Duration is not always indicative of the damage potential of a hazard event, however, in most cases the longer an event is “active” and causing damage, the greater the total damages will be. Specific benchmark factors used in the duration analysis are:

**10 points:** Long Duration, indicating the hazard event is likely to last longer than 1 week;  
**7 points:** Medium Duration, indicating the hazard event is likely to last from 1 day to 1 week;  
**4 points:** Short Duration, indicating the hazard event is likely to last from 12 to 24 hours;  
**1 point:** Minimal Duration, indicating the hazard event is likely to last less than 12 hours.

### Availability of Warnings

Availability of warnings indicates the likelihood that the public can be warned of a hazard. This measure does not address the availability of warning systems in a community. Rather, it looks at the overall availability of warning in general for a particular hazard event. For example, a community might receive warning that a flood will occur with 24 hours but receive no warning when a large fire is to occur. Generally, hazards that have little or no availability of warning tend to be more problematic for a community from a population protection and response standpoint. The specific benchmark factors used in the availability of warning analysis are:

**10 points:** Warning Unavailable, indicating that the nature of the hazard is such that warning of the hazard event is not available;  
**7 points:** Warning Generally Not Available, indicating that the nature of the hazard is such that warning of the hazard event is generally not available (less than 50 %) and generally not received in a timely manner;  
**4 points:** Warning Sometimes Available, indicating that the nature of the hazard is such that warning of the hazard event is available most of the time (50 to 99 %) and received in a timely manner;  
**1 point:** Warning Available, indicating that the nature of the hazard is such that warning of the hazard event is always available (100 %) and received in a timely manner.

### Speed of Onset

Speed of onset refers to the amount of time it typically takes for a hazard event to develop. Speed of onset is an important evaluation measure because the faster an event develops; the less time local governments have to warn the potentially effected population of appropriate protective actions. The specific benchmark factors used in the speed of onset analysis are:

**10 points:** Minimal or No Warning, indicating the hazard event could occur without any advanced notice or warning;  
**7 points:** Less than 12 Hours, indicating the hazard event usually allows less than 12 hours advance notice before occurring;

**4 points:** 12-24 Hours, indicating the hazard event generally allows 12-24 hours advanced notice before occurring;

**1 point:** Greater than 24 Hours, indicating the hazard event generally allows more than 24 hours advance notice before occurring.

### **Seasonal Pattern**

Seasonal pattern refers to the time of the year in which a particular hazard event can reasonably be expected to occur. Some hazard events can occur at any time of the year, while others occur primarily during one particular season. Oftentimes, hazard patterns coincide with peak tourism seasons and other times of temporary population increases, greatly increasing the vulnerability of the population to the negative impacts of certain hazard events. The specific benchmark factors used in the seasonal pattern analysis are:

**10 points:** Year-round Occurrence, indicating the hazard event can occur at any time of the year;

**7 points:** Three Season Occurrence, indicating the hazard event can realistically occur during 3 seasons of the year;

**4 points:** Two Season Occurrence, indicating the hazard event can realistically occur during 2 seasons of the year;

**1 point:** One Season Occurrence, indicating the hazard event realistically occurs during only 1 season of the year.

### **Predictability**

Predictability refers to the ease with which a particular hazard event can be predicted, in terms of time of occurrence, location, and magnitude. Predictability is important because the more predictable a hazard event is, the more likely it is a community will be able to warn the potentially effected population and to take other preventative measures to minimize loss of life and property. The specific benchmark factors used in the predictability analysis are:

**10 points:** Unpredictable, indicating the hazard is extremely difficult, if not impossible, to predict;

**7 points:** Somewhat Predictable, indicating the time of occurrence, location, and magnitude of the hazard can be predicted with less than 50 % accuracy;

**4 points:** Predictable, indicating the time of occurrence, location, and magnitude of the hazard can be predicted at 50 % or greater accuracy;

**1 point:** Highly Predictable, indicating the time of occurrence, location, and magnitude of the hazard is predictable virtually 100 % of the time.

### **Mitigation Potential**

Mitigation potential refers to the relative effort with which a particular hazard event can be mitigated against through the application of structural or non-structural mitigation measures. Generally, the easier a hazard event is to mitigate against, the less of a future threat it may pose to a community in terms of loss of life and property. The specific benchmark factors for the mitigative potential analysis are:



**10 points:** Very Difficult to Mitigate, the hazard itself cannot be mitigated, although vulnerability can be lessened by focusing upon characteristics of physical development and awareness by the population;

**7 points:** Difficult to Mitigate, indicating that there are very limited choices for mitigating, and not all measures may prove effective in lessening the vulnerability to the hazard;

**4 points:** Possible to Mitigate, indicating there are some structural and non-structural measures that can be applied, but not all can be applied in an economic manner or are completely effective to lessen or eliminate future vulnerability;

**1 point:** Easy to Mitigate, indicating there are a wide variety of structural and nonstructural measures that can be reasonably and economically applied to lessen or eliminate future vulnerability.

### Hazard Scoring

The Hazard Mitigation Committee met in June of 2018 and reviewed Arenac County's hazard risks. The hazards were listed essentially by the importance designated to them by the participating county communities. Structural fires, severe winter weather, and thunderstorms. being paramount to these communities. The committee members then rated each hazard by the categories indicated earlier and a total weighted score was calculated for the hazards. Once all the factors were assessed, some counterintuitive results from the community perceptions became apparent. *Predictability* and *mitigation potential* had considerable effects on total score outcomes, as did the extent of effects in terms of the population affected, potential size of areas affected, collateral damage, and economic impacts.

In order to rank the hazards from the most severe threat to the least threat, each aspect of every hazard was assigned a specific point value of 10, 7, 4, or 1 point, based on each factor's relative severity and negative impacts. A higher point value was given to aspects and hazards that were associated with a more severe potential impact. The results of the committee's evaluations are shown without weighting on the following matrix:

Hazard	Historical Occur.	Seriously Affected Pop.	Collateral Damage	Population Impact	Econ. Impacts	Affected Area	Duration	Avail. of Warnings	Speed of Onset	Seasonal Pattern	Predict.	Mitigat. Potential	Total Score
Structural Fire	10	1	1	1	7	1	1	1	10	10	1	4	48
Severe Winter Weather	10	10	4	4	7	10	7	4	4	7	4	10	81
Thunderstorm	10	10	4	4	7	10	7	4	4	7	4	10	81
Wildfire	10	1	4	1	1	1	1	7	10	7	10	10	63
Infrastructure Failure	10	10	1	1	4	10	7	10	10	10	10	10	93
HazMat Transportation	1	1	4	1	1	7	1	10	10	10	10	10	66
Sabotage / Terrorism	1	1	1	1	1	1	1	10	10	10	10	20	51
Transportation Accident	10	7	4	4	10	10	1	10	10	10	10	7	93
Tornado	4	1	10	1	10	7	7	4	4	1	10	4	63
Oil/Gas Well Accident	4	1	10	1	4	1	1	10	10	10	10	4	66
Public Health Emergency	10	4	10	4	4	10	7	7	7	10	10	4	87
Dam Failure	1	1	1	1	1	1	1	1	1	10	10	4	33
Petroleum/Natural Gas Pipeline Accident	10	1	4	1	1	1	1	10	10	10	10	4	63
Civil Disturbance	1	1	1	1	1	1	1	10	10	10	10	1	48
Flooding	7	4	10	1	10	10	10	7	7	7	10	4	87
Drought	4	10	10	1	10	10	10	1	1	7	10	4	78
Extreme Heat	10	10	10	4	10	10	7	1	1	4	10	4	81
HazMat Fixed Site	1	1	1	1	1	1	1	10	1	10	10	4	42
Scrap Tire Fire	10	1	10	1	4	4	1	10	10	10	10	4	75
Earthquake	4	1	1	1	1	1	1	10	10	10	10	10	60

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## LOCAL CAPABILITIES ASSESSMENT

**Emergency Management** – Have communication and organization skills  
– Lacking funding

**Sheriff's Department** – Competent management  
– Sufficient funding  
– Well trained personnel

**City of Au Gres Police Department**  
– Good personnel and operations  
– Well-funded

**Fire Departments:**

Au Gres - well-run; well-funded  
Standish - competent and well-run  
Sterling – Struggling with personnel and funding  
Moffatt – Well funded and well-trained personnel  
Twining – Struggling with personnel and funding

**Mobil Medical Response (EMS)** – Some problems with control (private) and expensive

**Red Cross** – Active but lacking sufficient funds; lack volunteers

**Central Michigan District Health** – Active and competent

**Effective Mutual Aid Agreements with:**

Michigan State Police  
Department of Natural Resources  
U.S. Border Patrol  
Midland Fire Department  
Saginaw Chippewa Indian Tribe

## Vulnerability Assessment

This step measures the vulnerability of Arenac County to potential hazards. When the potential hazards are compared to the Community Profiles, including the physical profile and social profile, the potential for harm becomes apparent. It is serious when hazards are combined with people or resources both natural and economic. Hazard Mitigation planning intends to make hazards less damaging to people and resources.

This step looks at such points as population concentrations, age-specific populations, development pressures, types of housing (older homes, mobile homes), presence of agriculture, valuable natural resources, and other issues that may make Arenac County more

vulnerable to specific hazards. Basic criteria are listed below. High Vulnerability: If an event occurred it would have serious impact on both the safety and financial impact of County residents and businesses.

Medium Vulnerability: If an event occurred it would have minimal impact on the safety of residents but would have a serious financial impact on County residents and businesses.

Low Vulnerability: If an event occurred it would have no impact on the safety of County residents and minimal financial impact on County residents and businesses.

### **Structural Fire**

Structural fires can happen anywhere and anytime throughout Arenac County. Homeowner negligence is a factor with structural fires. Smoking, electrical appliances, storing combustible materials, and many other circumstances can cause a house fire. Businesses can have the same circumstances that cause fires. The county fire departments are mostly volunteer, so the response times may be longer. Of the 8,998 occupied units in the county, 31.1% use utility gas, 43.4% use bottled, tank or LP gas, 5.8% use electricity, 4.4% use fuel oil or kerosene, 13.8% use wood, and 1.5% use another fuel. Wood fires in the home pose a higher risk than the other fuels. 13.8% of the population in Arenac County uses wood as a fuel and that poses a greater than normal risk since there is already controlled fire in the house. Structural fires are universal hazards and Arenac County is **highly vulnerable** to them.

### **Severe Winter Weather Hazards**

Winter weather hazards such as blizzards, sleet, freezing rain, and heavy snow are known hazards in Arenac County, and they can occur multiple times every winter. There is no pattern to the occurrence of winter hazards, which means one year can have none while the next year has multiple storms. While there has not been damage from every storm, there is a possibility of damage from each winter storm. Damages from winter weather hazards totaled 5.1 million dollars from 1950 to 2015. Since these figures were recorded for each storm and not the county, it is unknown if the damage from these figures is for Arenac County alone.

Winter weather hazards happen all over the county, and the people that are most affected are the elderly, homebound, and disabled. Infrastructure problems can occur with a more severe storm that causes power lines to break from the weight of the snow or ice. Branches from trees may fall on power lines and cause power outages. Health problems may occur to vulnerable populations due to the power outages that might cause adverse conditions in their homes. Almost a quarter of the county's population is very vulnerable to winter weather hazards. All areas and populations of the county have **high vulnerability** to winter weather hazards.

### Thunderstorm Hazards

#### **Lightning**

Lightning kills more people than hurricanes or tornadoes. Lightning is a very common hazard that people tend to ignore. Economic loss from lightning can include infrastructure damage, private property damage, and wildfires. There has been one recorded event in Arenac County according to the National Climatic Data Center. Lightning is mainly associated with thunderstorms, and they usually occur in the warmer months. This means that there are more people in the county during influx of seasonal population. People also tend to spend more time outdoors. Outdoor events and festivals need to take precautions with the crowds to keep them safe. Lightning happens on a smaller scale in localized spots, but it can affect large areas. Arenac County has a **high vulnerability** to lightning.

#### **Severe Winds**

Severe wind is a hazard that is prevalent usually during severe thunderstorms. These events can happen multiple times in any year, and they can cause extensive damage to all areas of the county. Forty-six thunderstorm and high wind events have been recorded in Arenac County since 1957. These events have caused four injuries and \$324,500 in damages. The damage totals and other statistics are taken from some events that involved an area larger than Arenac County. Some of the totals do not apply to Arenac County, but the storm that caused the totals affected Arenac County. Severe winds are most likely to be associated with thunderstorms that occur in the summer but can occur any time of year. One of the most powerful windstorms ever recorded in the Great Lakes region occurred on November 10, 1998. Wind speeds from this powerful storm reached 87 knots. Homes in wooded areas may not be damaged from the winds, but trees or branches may fall and damage homes costing thousands of dollars to repair. Arenac County has **high vulnerability** to severe winds.

### **Hail**

Hail is a hazard that is also associated with severe thunderstorms. Economic loss is potentially very high with damage to homes, cars, and crops. The potential for death is low but the chance is there if people are caught outside when larger hailstones are falling. There have been 41 hail events in Arenac County since 1977. There is a chance for hail in every thunderstorm season and it very hard to predict when and where this event will occur. Arenac County has **high vulnerability** to hail events.

### **Wildfire**

When conditions are dry, any type of forest can succumb to wildfires. Certain types of vegetation are more susceptible to wildfire, such as coniferous trees (e.g.-red pines, jack pines). Trees that are a moderate risk to wildfire are mainly deciduous, such as oak or birch. There are areas of lowland hardwood, red and white pine, and northern hardwoods in Arenac County and these areas are designated high risk. Campgrounds in these areas are especially dangerous because visitors might not know the local conditions. They must be informed to keep conditions safe.

With the amount of forest cover in the county, the whole county is considered to have **high vulnerability** to wildfire hazards.

### **Infrastructure Failure**

Power outages are the greatest concern in the category of infrastructure failures. Losing power for extended periods of time can cause many problems especially in the summer or winter. The older population may find it difficult to do many of their daily routines. After a few days, people may become ill due to lack of heat in the winter or heat exhaustion in the summer. Infrastructure failure may be caused by adverse weather conditions, wildfires, or sabotage. The county is covered by a high percentage of forest, so it raises the chances of trees or branches falling on power lines. Phone service is vital for Arenac because cell phones have limited coverage areas. Heavy rains and spring thaw can inundate or wash away sections of road that can cause death or injury. Historic problem areas on roads need to be improved in order to prevent loss of life or property damage. Due to the many variables and systems in the infrastructure network, the whole county is considered **highly vulnerable** to infrastructure failure.

### **Hazardous Materials Incidents – Transportation**

Hazardous Materials Transportation has a potential to cause injury, but the areas are confined to the main trunklines such as M-61, M-65, US-23, M-13 and I-75. I-75 is an especially high risk because freeways have high volumes of traffic that carry large amounts of hazardous materials across the state. Arenac County has a **high vulnerability** to hazardous material incidents.

### **Sabotage and Terrorism**

Sabotage and terrorism objectives vary widely, so too are the potential targets of such actions. Virtually any public facility or infrastructure, or place of public assembly, can be considered a potential target. In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges and universities.

Although at first it might appear Arenac County is an unlikely target for terrorism, it cannot be totally discounted. Potential targets include water treatment plants, the runways at the airports, and all industrial sites in the area. Furthermore, any government building, schools, or individual can become a target of domestic terrorism. Arenac County has a **medium vulnerability** to Sabotage and Terrorism.

### **Transportation Accidents**

#### **Air Transportation Accidents**

Although there are not commercial air passenger services at the West Branch Community Airport, there are many small planes that takeoff and land at this facility. The possibility of an air transportation accident occurring is not out of the question. Statistics from the National Transportation Safety Board and the airline industry show that the over 75% of airplane crashes and accidents occur during the takeoff or landing phases of a flight. West Branch Township, the City of West Branch, and Horton Township all have **medium vulnerability** to air transportation accidents.

#### **Land Transportation Accidents**

Although public modes of land transportation have an excellent safety record, the combination of large numbers of passengers, unpredictable weather conditions, potential mechanical problems, and human error always leaves open the potential for a transportation accident involving mass casualties. The case in Clare County involving a tour bus that slid off the road due to rainy conditions is an example. Also, see page 139 for Arenac County hazardous materials incident. With the one major freeway and three state highways that traverse the county, the whole county is considered **highly vulnerable** to transportation accidents.

#### **Water Transportation Accidents**

Arenac County has many lakes that are used for recreation throughout the year. Many lakes in Arenac County are known statewide for boating and summer vacationing. The high influx of boats and jet-skis cause more problems and accidents with inexperienced operators. The large amount of pleasure boaters in the summer months makes the county **highly vulnerable** to water transportation accidents.

### **Tornadoes**

Tornadoes are rare but cause the damage that can be felt for years. Since 1977, seven tornadoes have hit Arenac County causing \$340,000 in damages. Of the tornadoes that touched down in Arenac County, rated on the Fujita Scale, three have been no F0, two F1, and three F2. Tornadoes usually occur in the warmer months when a significant amount of seasonal population moves into the county. One death and 19 injuries have been recorded in the time period. The increase in population raises the chances of people getting injured or losing their life. There are few things that can be done to prevent damage from a tornado. People should be advised to go to their basements or have plans to get to a designated community shelter quickly if they do not have a basement. All of Arenac County is considered **highly vulnerable** to tornadoes.

Other areas for concern are campgrounds and community events. Campgrounds are extensively used during prime summer months and on Memorial and Labor Day weekends. Campgrounds have large concentrations of transient populations staying in structures that are highly vulnerable to severe storm events.

### **Oil and Gas Well Incident and Petroleum/Natural Gas Pipeline Accidents**

Oil and gas well incidents could be a major problem in Arenac County. A significant number of wells are located in the county along with a few pipelines. Pipelines traverse the county. There are wells located all over the county, but the majority are located in the western half of Arenac County. A significant number are in Deep River Township, Clayton Township, and Adams Township. Due to the high number of oil and gas wells in the county and the pipelines that cross the county, Arenac County has a **high vulnerability** to oil and gas well incidents and petroleum and natural gas pipeline accidents.

### **Dam Failure**

Arenac County has one dam that is rated as a significant hazard. The dam owners are responsible for having dam safety inspection reports completed and emergency action plans approved every three years. Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, requires that dam owners prepare, and keep current, Emergency Action Plans (EAP) for all high and significant hazard potential dams. An EAP is defined as “a plan developed by the owner that establishes procedures for notification of the department, public off-site authorities, and other agencies of the emergency actions to be taken prior to and following an impending or actual failure of a dam.” These EAP are approved and on file with the county Emergency Management Coordinator. There is only one dam of “significant hazard” in Arenac County. Arenac County has a **low vulnerability** except the area surrounding the Forest Lake Dam.



**ARENAC COUNTY CRITICAL FACILITIES**

Arenac County Emergency Management & Homeland Security

Saginaw-Midland Water Supply Corporation

City of Au Gres Water & Waste Systems

City of Standish Water & Waste Systems

Mobile Medical Response – Emergency Medical Services

Standish Area Fire Authority (#12 & #13)

Sterling Area Fire Department (#14)

Moffatt Township Fire Department (#15)

Twining-Mason-Turner Fire Department (#16)

Au Gres-Sims-Whitney Fire Department (#18)

Ascension Standish Hospital

Ascension Au Gres Family Clinic

Michigan Department of Transportation

I-75

US23

# Chapter 6 *Hazard Mitigation Plan*



## The Hazard Mitigation Plan and Mitigation Strategies

Research conducted as a part of the preparation of this plan reveals that, relative to other areas of the United States, Arenac County is a relatively safe place to live, one where loss of life and damage to property from these hazards is relatively low. The Arenac Community is not plagued with threats from recurrent hurricanes, riverine flooding common to the areas of the Midwest, earthquakes of the potential evident in the Western United States, or the types of wildfires common in dry climates on the West Coast. The community does, however, face significant threat to life and property associated with structural fires and wildfires, severe winter snow and ice storms, thunderstorms, and tornadoes. The county also may face the consequences of hazardous materials accidents, oil and gas accidents, and terrorism.

The purpose of this plan is to anticipate the potential consequences of these events upon the community and to take measures and to implement strategies to minimize the impact and the severity of these hazards on the community. The plan is intended to protect the health, safety, and economic interests of residents reducing the effects of these natural and man-made hazards through hazard mitigation planning, awareness, and implementation. Actions taken to eliminate or reduce long-term risk to human life and property will not only help to minimize the impacts of disasters but will enable a rapid recovery and restoration of community functions in the event of an occurrence. As such, the Hazard Mitigation Plan is an essential element of emergency planning as a part of the emergency services provided by Arenac County.

Local governmental units in Arenac County, in common with local units of government through the state, face increasingly difficult challenges in terms of revenues to fund governmental operations, activities, and programs. Planning for natural disasters and implementing measures to mitigate those disasters, can, in the long run, save tax dollars. FEMA has noted that every dollar spent on hazard mitigation results in a savings of four dollars. The wise use of expenditures to mitigate such hazards will benefit the community in terms of the need of funding for all local governmental operations. Limited dollars should be expended where they generate the greatest amount of effectiveness in terms of the delivery of public services.

The following are hazard mitigation goals derived from the risk assessment. These goals are general guidelines that explain what the community wants to accomplish. They are long term and represent broad visions. The objectives define strategies or implementation steps to attain the identified goals. Actions for local communities, community organizations, and others to take are set forth in the action plan.

**GOAL 1: Protect Public Health and Safety**

OBJECTIVES

- Provide community wide hazard warning systems (natural, health, and terrorism)
- Provide information and resources to increase hazard awareness and education
- Maintain existing resources and equipment and provide necessary training on how to use them
- Identify and obtain additional necessary resources and equipment to prevent or minimize hazard effects.

**GOAL 2: Minimize Damage and Economic Loss to Public and Private Property**

OBJECTIVES

- Promote policies to make properties less vulnerable
- Apply mitigation measures to prevent hazard damage
- Obtain necessary equipment (e.g., contractors with cranes to help with dams), resources, and training to protect property if a hazard occurs
- Conduct training sessions and exercises to prepare for possible hazards.

**GOAL 3: Maintain Natural and Man-made Systems and Essential Services**

OBJECTIVES

- Identify, inspect, and maintain all critical infrastructure and facilities
- Improve security for the County Courthouse
- Repair or replace critical infrastructure and facilities that are damaged or degraded
- Protect critical infrastructure and facilities from hazard damage
- Obtain necessary resources and equipment to ensure essential services are maintained in the event of a hazard
- Work with the Department of Natural Resources and the Michigan Department of Environmental Quality to identify how to minimize disaster effects on vital natural resources.

**GOAL 4: Manage Growth and Development for Hazard Mitigation**

OBJECTIVES

- Develop hazard resistant growth policies
- Restrict development in high hazard areas
- Integrate hazard mitigation planning into land use planning
- Encourage sustainable development
- Protect and conserve natural resources.

The next step in the hazard mitigation planning process is to identify mitigation actions

suitable to the community, to evaluate the effect the actions will have on the specified

mitigation objectives, and to prioritize actions to decide in what sequence or order these actions should be pursued.

Mitigation actions can be grouped into seven broad categories:

**1. Prevention.** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

**2. Property Protection.** Develop actions that involve the modification of existing buildings and structures to protect them from hazards, or to remove them from a hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass. It can also include changing the landscape around buildings, brush and grass removal, and flood reduction systems.

**3. Public Education and Awareness.** Develop actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosures, hazard information centers, and school-age and adult education programs.

**4. Natural Resource Protection.** Develop actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest, and vegetation management, and wetland restoration and preservation.

**5. Emergency Services.** Develop actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.

**6. Structural Projects.** Develop actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

**7. Cyber Security Protection and Access Control.** Access and identity verification apply a broad range of physical, technological, and cyber measures to control admittance to critical locations and systems, limiting access to authorized individuals to carry out legitimate activities. Cybersecurity protects against damage to, the unauthorized use of, and/or the exploitation of (and, if needed, the restoration of) electronic communications systems and services (and the information contained therein).

Mitigation actions may be characterized by their relevant urgency. Many of the actions proposed for mitigation in Arenac County are ongoing programs. Included among these are:

- Public education programs
- Outreach to vulnerable populations
- Development of and training for the emergency response team
- Provision of proper and adequate equipment for emergencies
- Weather spotters
- Debris management program
- Assistance to vulnerable populations such as shelters and payment of heating bills
- Emergency plans and evacuation procedures for various hazards including schools, businesses, and the community as a whole
- Mutual aid pacts with local agencies and neighboring communities
- Emergency media broadcasts
- Dam emergency action plans
- Emergency action plans and emergency operations plans

### **Mitigation Strategies for Specifically Identified Hazards**

The major hazards identified in the Risk Assessment and by the Hazard Mitigation Committee fall into the broad categories of fires, severe weather, hazardous materials, and transportation accidents. Fire hazards include structural fires and wildfires. Severe weather events include winter storms, thunderstorms, and tornadoes. This category overlaps with transportation accidents and infrastructure failures and are usually a consequence of the above events or because of sabotage or terrorism. Although no events of sabotage or terrorism have taken place in the county, the prevalence of these activities throughout the world has raised the possibility of their occurrence locally. Also, the connectivity and use of computerized systems for public records and public infrastructure makes these systems vulnerable to sabotage.

Meetings were held with each Arenac County municipality where 1) the goals of the Hazard Mitigation plan, 2) the risk assessment developed by the Hazard Mitigation Committee, and 3) possible mitigation actions were discussed. The primary concerns expressed by the individual communities were the same as the counties. Major actions identified for mitigation activities include:

- Identification and upgrade of hazardous road stream crossings
- Pursue Department of Natural Resources involvement in Arenac County emergency management activities and participation in the Local Emergency Planning Committee and Local Planning Team. Major Department of Natural Resources concerns are wildfires and Rifle River emergency rescues
- Continue to develop contact systems for the elderly and disabled-reverse 911, weather radios, contact lists, and city “Remind” system of text notification

- Identify sufficient local safe buildings



- Installation of additional warning sirens
- Address utility needs during storms – electricity, sanitary sewers, water, and storm sewers.
- Frequent power outages and communication cuts during storms (dead Ash trees causing many problems). Address power line easement clearing.

The community meeting results were reviewed by the Hazard Mitigation Committee and actions were put forth by committee members.

Due to Damage from Flooding from 9 inches of rain in 48 hours a Long-Term Recovery Group was established with the assistance of UMCOR and FEMA to plan for the Recovery of Arenac County. To mitigate future flooding Arenac County EM is applying for Hazard Mitigation Grants from FEMA.

Despite almost every community discounting the possibility of civil disturbances and acts of terrorism, there are possibilities of such occurrences in the county. (There are persons on the federal watch list in the county.)

Central Michigan District Health Department (CMDHD) actions and its part in health emergency preparedness, including new program for preventing the Zika virus, were implemented as of January 2020 CMDHD has kept strict guidelines with the state of Michigan and CDC on COVID -19 response measures.

The Department of Health and Human Services cooperates with The Red Cross which maintains a list of facilities that are used for emergency shelters. Arenac County has established a Community Center in Standish that acts as a staging area/POD/community cooling/heating station.

The following are strategies to address specific hazard identified by the Hazard Mitigation Committee and the local municipalities:

### **Structural Fires**

Structural fires pose a threat to human life and are a leading cause of property damage and destruction in Arenac County. In addition to these losses, the cost of fire protection services is one of the highest budgeted items for most local units of government. Mitigation strategies both to reduce the incidence of structural fires and to reduce the cost of fire protection services are as follows:

1. Expand the use of the fire protection sprinkler systems, particularly in existing older buildings in downtown areas. Fire protection sprinkler systems are effective in extinguishing structure fires. Sprinkler systems are especially important in buildings in the Standish and Au Gres downtown areas because buildings are located close to, or attached to, on another, and because of the number of persons working in buildings, evacuation is difficult. It is suggested that a committee be established to consist of the

emergency management coordinator for the county, the fire chief for the City of West Branch, and building owners in the downtown area, to discuss and address this issue.

2. Arenac County has a good system of fire protection provided by its local units of government. An effective mutual aid system exists. While the community has made much progress in the development of intergovernmental cooperation in responding to fire emergencies and in the areas of equipment purchases and training, more should be done to promote cooperation among the units and to reduce fire protection costs. The goal of such efforts should be the enhancement of fire protection services at a reduced cost. The responsibility for the implementation of these measures' rests with the local units of government and their collective fire departments.

### **Ice and Snowstorm Emergencies**

Arenac County has experienced numerous ice and snowstorm emergencies. These emergencies are associated with large amounts of snowfall and ice storms in which the accumulation of ice results in slips and falls, transportation hazards due to impassable or slippery conditions, downed trees and tree limbs, and energy failures associated with fallen tree limbs and the weight of ice on powerlines and poles. Mitigation strategies for ice and snowstorms are as follows:

1. Pre-plan for debris management staging and storage areas. In anticipation of downed trees, tree limbs, and snow accumulation, strategies must be in place to predetermine locations for the collection and processing of snow, tree limbs, and other debris. The establishment of such staging areas will facilitate the clearing of roads and handling of debris and snow.
2. Identify local schools and other public buildings throughout the county which could be designated as warming shelters where vulnerable residents can go to escape the effects of loss of heat in their homes due to power outages. Once identified, a public awareness campaign should be initiated to inform citizens of the availability of these shelters. MOA's have been established with County for removal and disposal of storm debris.
3. Continue to develop notification and aid systems such as the "Remind" program in the City of West Branch and reverse 911 for the elderly and others needing assistance before, during, and after emergencies.

### **Thunderstorm Hazards**

Severe thunderstorms occur very often in Arenac County. These storms can cause great physical damage and occasionally bodily harm or death to individuals. They can also cause disruption of electrical service and other infrastructure.

1. Engage electricity providers to continue clearing power line easements to prevent power outages especially in the rural areas of the county.
2. As with snowstorms, establish safe buildings where residents and visitors to the county can go if power and communications are disrupted.
3. Continue to develop notification and aid systems.
4. Consumers Energy and Regional Food Banks are in direct coordination with Arenac County EMC to provide community relief during outages.

### **Wildfires**

The extensive forests and other undeveloped areas in Arenac County make the possibility of wildfires extremely high. The Department of Natural Resources is responsible for wildfire suppression on state land in the county. The Hazard Mitigation Committee and Emergency Management Director should take the following actions for mitigation of wildfire effects:

1. Providing information and presentations to inform landowners how to reduce susceptibility to wildfires in vulnerable locations should be undertaken. General information on preventing wildfires will be disseminated to county residents through advertisements, school notices, and at various events.
2. Encourage the Michigan Department of Natural Resources to cooperate with emergency planning with the Arenac County.

### **Transportation Accidents, Hazard Material Transport, and Oil and Gas Accidents**

Because of Arenac County's highway system, railways, pipelines, and the makeup of its undeveloped sector, the county is vulnerable to transportation accidents which may include hazardous material spills, gas and oil leaks and spills, including hydrogen sulfide leaks. Whatever agency is first on the scene, e.g., sheriff's department, takes control of site operations and informs emergency management and others for containment, etc. Actions that may reduce the occurrence of incidents include:

1. Rigorous enforcement of weight restrictions and speed limits
2. Enforce USDOT and MDOT regulations regarding hazard material transport
3. Development of site emergency plans of entities near oil, gas, production, and pipelines
4. Disseminate information regarding hydrogen sulfide.

### **Energy and Infrastructure Disruptions**

As indicated earlier, storms, fires, and various accidents can cause disruptions of energy transmission that can also lead to water, sewer, and other infrastructure dysfunctions. In addition to the strategies proposed under the previous categories, the following are proposed:

1. Critical facilities, hospitals, schools, jails and prisons, nursing homes, emergency communication facilities, care facilities, and similar institutions require the use of backup generators for electrical power in the event of a power failure. A listing of such critical facilities will be prepared and an inventory of backup generating equipment, including their capacity and condition, will be prepared to develop an estimate of equipment and facility needs. Based upon the inventory, a prioritized listing of equipment needs, and costs can be assembled so that the purchase, update, or repair of equipment can be scheduled based on resources available.
2. Where possible, to resist damage from severe winds and the accumulation of ice, electrical and telephone lines should be buried where the costs associated with the activity can be justified based upon the costs of service disruption, the likelihood of occurrence, and the public health and safety risks to the community.
3. Redundancies in utility and communication systems, especially those associated with critical community, safety, health, and business activities, will be implemented where feasible.

### **Sabotage and Terrorism**

Although most communities dismissed the likelihood of civil disturbances, sabotage, and terrorism, law enforcement officials have indicated that there are possibilities for these actions to be carried out.

1. Law enforcement agencies, state police, local police, and sheriff departments should continue to cooperate to prevent individuals or groups from carrying out these types of acts.
2. The federal program "If You See Something, Say Something" campaign has been implemented to make businesses, local governments, and citizens aware of potential threats, methods promoted on how to protect various vulnerable assets, and how to respond to suspicious behavior.
3. The types of possible threats, including cyber security and access control, should be identified with recommended actions to be taken by communities and individuals to prevent these events.

The following Arenac County Implementation Strategy Tables detail mitigation actions, possible financing, and their status by hazard.

**Table 32 – Implementation Strategy**

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions A. Multi-Hazard Actions</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Build the capabilities of the county GIS program to function as a tool to address multiple hazards. This effort would require the creation/updating of datasets such as parcel/ownership, location of all structures, driveways with ingress/egress conditions, roads, forest types, ownership types, floodplains, utilities (power lines, gas lines, and water lines), wetlands, water features, bridges and culverts, (SARA III sites)	High	A, B, C, E, H, J, V	B, T, Q	Improving county mapping.  GIS Authority created and adding layers	Ongoing
Enhance and expand an all-hazards education and awareness program in schools, which includes classroom presentations and incorporating wildfire and weather hazard preparedness into school curriculums.	High	A, B, C, J, O,R	B, T	Programs being carried out.	Ongoing
Work with power companies to inventory condition of power line rights-of-way and identify priority sections to clear branches and trees from power lines. The end goal is to create and maintain a disaster-resistant landscape in public rights-of-way.	High	A, E, P, U	B, P, C	Power companies have accomplished much. Ash trees dying have created new problems.	Ongoing
Organize outreach program to vulnerable populations during and after hazard events, including wildfires, extreme winter and summer weather events, periods of extreme temperatures, public health emergencies, and other hazards that can impact the community.	Med.	A, D, H, I, J, N, O, V	B, C, T, Q	Council on Aging & Red Cross Programs LTRG created July 2020	Ongoing
Ensure key gasoline stations have the capacity to pump gasoline during power outages especially for emergency vehicles.	High	A, C, E, M, V	B, T	Some progress.	Ongoing
Continue to develop Emergency Response Team program to help prepare for all hazard events in the county.	Med.	A, B, C, D, E	B, Q, T	New LEPC including Fire, Police, TWPs and Volunteers created	Ongoing
Ensure that the county and individual communities have adequate equipment, staff, and training to respond to transportation-related accidents specific to their needs.	Med.	D, E, J, V	B, Q, T	Ongoing planning in the LEPC and LTRG meetings	Ongoing
Develop plans to identify and inform persons of "Safe Areas" during festivals/events. (Include signs and directions to shelters.)	Med.	I, J, V	B, I, N, G	Continued efforts.	Ongoing

<b>A.</b> County Emergency Management Office	<b>B.</b> County	<b>C.</b> Local Units of Government
<b>D.</b> Local Fire Departments	<b>E.</b> County Road Commission	<b>F.</b> EMCOG
<b>G.</b> MSU Extension/RC&D	<b>H.</b> District Health Department	<b>I.</b> American Red Cross
<b>J.</b> USFS & MDNR	<b>K.</b> Insurance Companies	<b>L.</b> Real Estate Companies
<b>M.</b> Local Businesses	<b>N.</b> Civic Groups and Churches	<b>O.</b> National Weather Service
<b>P.</b> Utility Companies	<b>Q.</b> State	<b>R.</b> Schools
<b>S.</b> Medical	<b>T.</b> Federal Government	<b>U.</b> Landowners
<b>V.</b> Law Enforcement		

Arenac County Implementation Strategy Table					
Mitigation Actions A. Multi-Hazard Actions	Priority	Responsible Agency	Funding Sources	Progress	Status
Increase usage of NOAA Weather Radio by subsidizing purchase and distribution of radios to county residents, organizations and businesses. Use NOAA radios as a community emergency alert system for information on hazard events.	Med.	A	T	Received grants/radios purchased and distributed to schools, foster care homes, and public buildings.  IPAWS and opt in alerting system being used (RAVE)	Ongoing
The county will continue to prepare future land use plans and capital improvement programs to plan for future needs.	Low	B, C	B, C	New County Master Plan 2016	Revise plan 2021 Revised Plan Complete 2021
Conduct workshops at community gatherings to encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Low	A, I, J, K, N	B, C, H, I, N, T	Continued progress.	Ongoing
Communities will acquire and maintain an adequate level of emergency power generators to supply emergency water needs, wastewater processing, emergency communications, emergency health care and shelters.	High	A, B, C	B, C, T	Municipal water systems can and have provided water to county residents during extended power outages.	Encouraging communities to acquire generators  MICIMS PODs set up for disasters
Communities will work with the Federal Emergency Management Agency (FEMA) to identify flood plains.	Low	A, B, C, T	T	FEMA currently creating a new flood plain is reflected on GIS	2025
Procure access to portable/changeable message signs to direct crowds and provide information.	Med.	A, B	N/A	MOA with DHD2 for use of mobile digital road signs	2021 Working w/ entities that have signs
Identify and hire optimal staffing levels for county emergency operation and seek funding.	Low	A, B	N/A	HSGP grant funds used to temp EM planners	County Board
Develop a plan for pet care and rescue during and after storms.	Low	A, B	N/A	New program in process with county animal control	2021

A. County Emergency Management Office	B. County	C. Local Units of Government
D. Local Fire Departments	E. County Road Commission	F. EMCOG
G. MSU Extension/RC&D	H. District Health Department	I. American Red Cross
J. USFS & MDNR	K. Insurance Companies	L. Real Estate Companies
M. Local Businesses	N. Civic Groups and Churches	O. National Weather Service

**Arenac County Hazard Mitigation Plan 2021**

<b>P. Utility Companies</b>	<b>Q. State</b>	<b>R. Schools</b>
<b>S. Medical</b>	<b>T. Federal Government</b>	<b>U. Landowners</b>
<b>V. Law Enforcement</b>		

## Arenac County Hazard Mitigation Plan 2021

Arenac County Implementation Strategy Table					
Mitigation Actions B. Thunderstorm Hazards (Summer)	Priority	Responsible Agency	Funding Sources	Progress	Status
Continue installing public early warning systems and networks.	Med.	A, B, C, O, and Media	B, T	Three sirens installed in 2019. Others in planning.	Ongoing
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	A, H, I, K, N, J	B, T	Continued progress. <b>CERT Teams being developed county wide</b>	Ongoing
Organize outreach to isolated, vulnerable, or special-needs populations.	High	A, C, H, I, N, Q, S	B, H, T	Continued progress.	Ongoing
Plan for adequate road and debris clearing capabilities.	Med.	A, B, C, E, P, V	N/A	Road commission lead. <b>MOUs with private debris removal companies</b>	Ongoing
Identify flood prone road stream crossings and develop schedule for reconstruction to carry flood waters.	High	A, E	N/A	Road commission lead. <b>Several culverts upgraded after flood in 2020</b>	Ongoing
Provide public education and awareness of thunderstorm dangers.	Med.	A, G, O, Media	N/A	Continued progress.	Ongoing
Identify then construct where necessary concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.	Low	A, B, C, J, M, R	C, T	Gain support from various entities.	2025
Increase coverage and use of NOAA Weather Radio.	Med.	A, O	T	Progress made; Radios procured and distributed. <b>IPAWS (RAVE)</b>	Ongoing
Continue organizing outreach to vulnerable populations during periods of severe weather events, including establishing and building awareness of accessible heating and/or cooling centers in the community, and other public information campaigns about this hazard.	Med.	A, C, H, N, S	B, C, H, T	Continued progress. <b>Location in south county established, working on one in the north and western county</b>	Ongoing
Develop or update emergency response plans for schools, campgrounds, fairgrounds, parks, community events, and marinas.	High	A, G, N, R	B, I	Updates ongoing	Ongoing

A. County Emergency Management Office	B. County	C. Local Units of Government
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G. MSU Extension/RC&D	H. District Health Department	I. American Red Cross
J. USFS & MDNR	K. Insurance Companies	L. Real Estate Companies
M. Local Businesses	N. Civic Groups and Churches	O. National Weather Service
P. Utility Companies	Q. State	R. Schools
S. Medical	T. Federal Government	U. Landowners
V. Law Enforcement		



## Arenac County Hazard Mitigation Plan 2021

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions B. Thunderstorm Hazards (Summer)</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Training and increased use of weather spotters.	Med.	A, C, O	O	Attended NWS workshops	Ongoing
Ensure proper anchoring of manufactured homes and exterior structures such as carports and porches.	Low	B	N/A	County Building Department lead.	Ongoing
Pre-planning for debris management staging and storage areas.	Med.	A, E	N/A	County Road Commission lead.	Ongoing
Farmer preparedness to address livestock needs/problems.	Med.	A, B, C, G	N/A	MSU Extension lead.	Ongoing

<b>A. County Emergency Management Office</b>	<b>B. County</b>	<b>C. Local Units of Government</b>
<b>D. Local Fire Departments</b>	<b>E. County Road Commission</b>	<b>F. EMCOG</b>
<b>G. MSU Extension/RC&amp;D</b>	<b>H. District Health Department</b>	<b>I. American Red Cross</b>
<b>J. USFS &amp; MDNR</b>	<b>K. Insurance Companies</b>	<b>L. Real Estate Companies</b>
<b>M. Local Businesses</b>	<b>N. Civic Groups and Churches</b>	<b>O. National Weather Service</b>
<b>P. Utility Companies</b>	<b>Q. State</b>	<b>R. Schools</b>
<b>S. Medical</b>	<b>T. Federal Government</b>	<b>U. Landowners</b>
<b>V. Law Enforcement</b>		

## Arenac County Hazard Mitigation Plan 2021

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions C. Winter Weather Hazards</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Maintain adequate road and debris clearing capabilities	High	A, B, C, E, U, V	N/A	Road Commission continue efforts.	Ongoing
Inventory problem areas on roads. Place snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting snow over critical roadway segments.	Low	E, V	E, Q	Road Commission lead.	Continuing Work
Establishing heating centers/shelters for vulnerable populations.	High	A, B, C, I, N	H, I, Q, T	Red Cross lead. Establish TWP centers in each TWP	Ongoing  2022
Continue producing and distributing family emergency preparedness information relating to severe winter weather hazards.	Med.	A, C	C, Q, T	Schools program (RAVE) opt in program	Ongoing
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Med.	A, H, I, K, N, T	B, T	Continued program. Being developd in LTRG	Ongoing
Increase coverage and use of NOAA Weather Radios.	Med.	A, O	T	IPAWS (RAVE)	Ongoing
Compile a listing of homes and facilities with vulnerable residents such as elderly, informed, and disabled individuals; and establish outreach procedures for assisting residents after severe winter storm events including payment of heating bills.	High	A, C, H, N, Q	A, H, T	Progress made. TWP projects	Ongoing
Pre-arrange for shelters for stranded motorists/travelers, and others.	Low	A, N, Q	B, C, I, N	Continued program.	Ongoing
Continue proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.	Low	B	N/A	County Building Department lead.	Ongoing
Inform farmers regarding preparedness to address livestock needs/problems.	Low	A, G	N/A	New program. MSU Extension	2018
Continue public education for using surge protectors on critical electronic equipment and home and public maintenance to prevent roof and wall damage from "ice dam."	Low	A, B, C, K	N/A	Continued program.	Ongoing

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<b>D. Local Fire Departments</b>	<b>E. County Road Commission</b>	<b>F. EMCOG</b>
<b>G. MSU Extension/RC&amp;D</b>	<b>H. District Health Department</b>	<b>I. American Red Cross</b>
<b>J. USFS &amp; MDNR</b>	<b>K. Insurance Companies</b>	<b>L. Real Estate Companies</b>
<b>M. Local Businesses</b>	<b>N. Civic Groups and Churches</b>	<b>O. National Weather Service</b>
<b>P. Utility Companies</b>	<b>Q. State</b>	<b>R. Schools</b>
<b>S. Medical</b>	<b>T. Federal Government</b>	<b>U. Landowners</b>
<b>V. Law Enforcement</b>		

## Arenac County Hazard Mitigation Plan 2021

Arenac County Implementation Strategy Table					
Mitigation Actions D. Wildfires	Priority	Responsible Agency	Funding Sources	Progress	Status
Inform residents by presentations and literature regarding proper evacuation procedures, such as wearing protective clothing (sturdy shoes, cotton or wool clothing long pants, a long-sleeved shirt, gloves and a handkerchief to protect the face), taking a Disaster Supplies Kit, and choosing a route away from fire hazards. Residents should plan several escape routes away from their homes – by car and by foot.	High	A, C, D, H, J, V	B, T	Continued program.	Ongoing
Create and enforce local ordinances that require burn permits and restrict campfires and outdoor burning.	High	A, B, C, D, V	B, C,	Need local municipalities support. <span style="color: red;">Done through DNR enforced by local fire dept.</span>	Meeting w/ communities  <span style="color: red;">TWP Meetings</span>
Promote media broadcasts of fire weather and fire warnings.	Med.	A, M, V	N/A	Continued program. <span style="color: red;">EAS, NWS, IPAWS, RAVE opt in</span>	Ongoing
Continue training and use of fire spotters, towers, and planes.	Med.	A, J	Q, T	<span style="color: red;">NWS weather, and Fire dept awareness classes</span>	Ongoing
Promote creation of defensible space around structures in fire-prone wildland areas.	Med.	A, C, D, I, J, K	T		
Distribute wildfire education material to homeowners and businesses through tax bills and encourage insurance companies to include wildfire safety information in materials provided by insurance companies to area residents.	Med.	A, B, K	K	Begin program.	Ongoing
Conduct multi-agency, inter-county emergency management response exercises for fire suppression.	Med.	A, D, I, J, V	T	Exercises conducted.	Ongoing
Promote and implement fuel management by thinning of flammable vegetation, creation of fuel breaks, use of fire-retardant materials/vegetation and selective thinning.	Med.	J, U	Q, T	Fuel breaks being created. DNR lead.	Ongoing
Ensure adequate water supplies for emergency firefighting (in accordance with NFPA standards).	Low	D, J, U	D, J, Q	Continued program.	Ongoing
Carry out prescribed burns and fuel management (thinning flammable vegetation, possibly including selective logging to thin out some areas).	Low	J, U	J, U	Continued program.	Ongoing
Coordinate county-wide wildfire education program by distribution of materials via direct mailings, school presentations, demonstration projects, displays at community events, and education materials at community libraries.	High	A, B, C, D, G, J, L, R	A, B, C, G, Q, R, T	Continue program.	Ongoing
Promote creation of defensible space around structures in fire-prone wildland areas.	Med.	A, C, D, J, K	A, B, C, J, T	Continue program.	Ongoing

## Arenac County Hazard Mitigation Plan 2021

A. County Emergency Management Office	B. County	C. Local Units of Government
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M. Local Businesses	N. Civic Groups and Churches	O. National Weather Service
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S. Medical	T. Federal Government	U. Landowners
V. Law Enforcement		

<b>Arenac</b>
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## Arenac County Hazard Mitigation Plan 2021

Mitigation Actions E. HAZ/MAT Transportation	Priority	Responsible Agency	Funding Sources	Progress	Status
Promote compliance with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport and enforcement of weight and travel restrictions.	High	E, V	G, Q, T	Road Commission and State Police lead.  County Sheriff dept program	Ongoing
Proper planning, design, maintenance of, and enhancements to designated truck routes.	High	C, B, E, Q, T	E, Q, T	Road Commission and municipal actions.	Ongoing
Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossings).	High	E, Q	E, Q, T	Road Commission and municipal actions.	Ongoing
Develop evacuation plans and community awareness of them.	Med.	A, B, C, D	B, C, T	Progress w/ Communities Disseminated with (RAVE) opt in program	Ongoing
Locate schools, nursing homes, and other special facilities away from major hazardous material transportation routes.	Low	A, B, C, D, R	B, C	County and municipal planning through site plan review.	Ongoing
Increase coverage and use of NOAA Weather Radios (which can provide notification to the community during any period of emergency, including large scale hazardous material incidents).	Low	A	T	Major progress.  IPAWS (RAVE)	Ongoing
Improve capability of agencies to carry-out road closures and to provide traffic control in accident areas.	Med.	E, V	E, T	Completed and ongoing.	Ongoing
Provide for trained, equipped, and prepared local hazardous materials emergency response teams and rescue teams.	Med.	A, B, C, D	B, C, T	Major progress.  Locally connected to the regional RRT region 3	Ongoing

<b>A.</b> County Emergency Management Office	<b>B.</b> County	<b>C.</b> Local Units of Government
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<b>G.</b> MSU Extension/RC&D	<b>H.</b> District Health Department	<b>I.</b> American Red Cross
<b>J.</b> USFS & MDNR	<b>K.</b> Insurance Companies	<b>L.</b> Real Estate Companies
<b>M.</b> Local Businesses	<b>N.</b> Civic Groups and Churches	<b>O.</b> National Weather Service
<b>P.</b> Utility Companies	<b>Q.</b> State	<b>R.</b> Schools
<b>S.</b> Medical	<b>T.</b> Federal Government	<b>U.</b> Landowners
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**Arenac County Implementation Strategy Table**

## Arenac County Hazard Mitigation Plan 2021

Mitigation Actions F. Infrastructure Failure	Priority	Responsible Agency	Funding Sources	Progress	Status
Procure and maintain generators for backup power at critical facilities.	High	A, B, C, R, S, T, V	B, C, H, M, S, T	Most sites identified. Review annually. Purchase as monies available.	Ongoing
Encourage or require burying of electrical and phone lines, where possible, to resist damage from severe winds, lightning, ice, and other hazards.	Low	A, B, C, P	M	Planning and zoning requirements in zoning ordinance.	Ongoing

## Arenac County Hazard Mitigation Plan 2019

Increase public awareness and widespread use of the “Miss Dig” utility damage prevention service.	Med.	A, B, C, M, Media	N/A	Programs continuing.	Ongoing
Identify sites and seek funding to improve critical road/stream crossings.	Med.	B, C, E, Q	B, C, Q, T	Road Commission lead. Progress continuing. <b>Many culverts upgraded 2021</b>	Ongoing
Continue programs/networks for contacting elderly or homebound persons during periods of infrastructure failure.	Med	A, B, C, H, I, N, S, V	B, C, H, I	Red Cross and Health Department continued program.  <b>Use of smart 911 and GIS starting 2021</b>	Ongoing
Protect electrical and communications systems from lightning strikes.	Med.	B, C, M, R, S	P, M, S	Continued program.	Ongoing
Establish redundancies in utility and communication systems, especially “Lifeline” systems.	Low	A, B, C, P	B, C, P	Redundancies in City of Standish and Townships. Continued program.	Ongoing

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<b>G.</b> MSU Extension/RC&D	<b>H.</b> District Health Department	<b>I.</b> American Red Cross
<b>J.</b> USFS & MDNR	<b>K.</b> Insurance Companies	<b>L.</b> Real Estate Companies
<b>M.</b> Local Businesses	<b>N.</b> Civic Groups and Churches	<b>O.</b> National Weather Service
<b>P.</b> Utility Companies	<b>Q.</b> State	<b>R.</b> Schools
<b>S.</b> Medical	<b>T.</b> Federal Government	<b>U.</b> Landowners
<b>V.</b> Law Enforcement		

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions</b> <b>G. Structural Fire</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Continue improved and continuing training for emergency responders, and provision of equipment for them.	High	A, B, C, D, V	B, F, Q	Training done and continuing.	Ongoing
Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, and recreation areas, and other appropriate sites.	High	A, B, C, D, M, N, R, S, V	B, C, M, T	Progress made. Continue programs.	Ongoing
Continue public education and school programs (especially about the use of stoves, heaters, fireworks, matches/lighters, etc.)	High	A, D, R	B, R, T	Programs presented and continuing.	Ongoing
Eliminate clandestine, illegal methamphetamine laboratories through law enforcement and public education.	High	V, Q	V, Q, T	Some operations shut down; continuing.	Ongoing
Provide proper maintenance of power lines and efficient response to fallen power lines.	High	P	P	Continued maintenance. <b>Consumers Energy program</b>	Ongoing
Provide continued education and literature regarding safe cigarette handling, candle use, fireworks, campfires, and holiday lights. The safe use and maintenance of fireplaces, stoves, and chimneys.	Med.	A, B, D, G, H, S	Q, T	Continuing programs. <b>Local fire dept meetings</b>	Ongoing

## Arenac County Hazard Mitigation Plan 2019

Require and encourage installation and maintenance of smoke detectors and fire extinguishers. Teach family members and residents how to use.	Med.	A, B, D, G, H, R	B, Q, T	Continuing regulation and inspections.	Ongoing
Promote proper workplace procedures and training for handling of explosive and flammable materials and substances.	Med.	A, D, K, M	Q, T	Continuing programs.	Ongoing



## Arenac County Hazard Mitigation Plan 2019

Do transportation planning that provides for roads, overpasses, etc. to maximize access and improve emergency response times and evacuation potential, for all inhabited or developed areas of a community. This includes transportation access within developed sites used as shopping malls, stadiums, office and commercial parking lots, etc.	Low	B, E, M, Q	E, M, Q, T	Requirements in place and local planning needs to ensure adequate review.	Ongoing
Control civil disturbances and criminal activities that could lead to arson.	Low	V	N/A	Regular law enforcement.	Ongoing
Identify adequate water supplies and dry hydrants for emergency firefighting. In areas lacking adequate water supplies, develop strategy to construct fire hydrants where needed.	High	A, B, C, D, E, K	Q, T	Dry hydrant and water drafting is continuous. Many dry hydrants are in place.	Long-term Ongoing

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<b>P.</b> Utility Companies	<b>Q.</b> State	<b>R.</b> Schools
<b>S.</b> Medical	<b>T.</b> Federal Government	<b>U.</b> Landowners
<b>V.</b> Law Enforcement		

**Arenac County Implementation Strategy Table**

Mitigation Actions	Priority	Responsible Agency	Funding Sources	Progress	Status
<b>H. Oil/Gas Pipeline/Well Accident</b>					
Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	High	A, B, C, D, M, N, R, S, T, V	B, C, D, M, N, R, T	Promoting plans and continue program. <i>County EM working with private Ems to develop congruent plans 2021</i>	Ongoing
Continue proper pipeline design, construction, maintenance, and inspection.	Med.	A, B, C, D, M, Q	Q	Continued program.	Ongoing
Establish contingency plans for worker and public protection, including the inclusion of rescue and evacuation procedures for well hazard areas in the local emergency operations plan.	High	A, B, C, D, H, I, N, Q, S, T, V	B, T	Some plans in place. Continue efforts. <i>Specialty fire dept training, regional RRT</i>	Ongoing
Increase public awareness and widespread use of the "MISS DIG" utility damage prevention service (800-482-7171) and increase public awareness of pipeline locations and appropriate emergency preparedness.	Med.	A, B, C, M, P	N/A	Continue program.	Ongoing
Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Low	A, H, I, K, N, P	B, T	Progress continuing. <i>Promoted at the Arenac Community Center</i>	Ongoing



## Arenac County Hazard Mitigation Plan 2021

Promote awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.	Low	A, B, C, G, M, P	Q, T	Progress continuing. <b>Promoted by local fire dept functions</b>	Ongoing
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<b>A.</b> County Emergency Management Office	<b>B.</b> County	<b>C.</b> Local Units of Government
<b>D.</b> Local Fire Departments	<b>E.</b> County Road Commission	<b>F.</b> EMCOG
<b>G.</b> MSU Extension/RC&D	<b>H.</b> District Health Department	<b>I.</b> American Red Cross
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<b>M.</b> Local Businesses	<b>N.</b> Civic Groups and Churches	<b>O.</b> National Weather Service
<b>P.</b> Utility Companies	<b>Q.</b> State	<b>R.</b> Schools
<b>S.</b> Medical	<b>T.</b> Federal Government	<b>U.</b> Landowners
<b>V.</b> Law Enforcement		

## Arenac County Hazard Mitigation Plan 2021

Arenac County Implementation Strategy Table					
Mitigation Actions I. Dam Failure	Priority	Responsible Agency	Funding Sources	Progress	Status
Maintain public awareness and warning systems in place.	High	A, B, C, D, Media	B, T	In place. New IPAWS (RAVE) opt in program 2021	Ongoing
Ensure consistency of dam Emergency Action Plans (EAP) with the local Emergency Operations Plans (EOP).	High	A, B, C, J, P and MDEQ	Q, T	In place and reviews are done every 2 or 5 years.	Ongoing
Maintain trained, equipped, and prepared search and rescue teams.	Med.	A, B, C, D, E, V	B, Q, T	Regular ERT training continuing. Regional RRT	Ongoing
Increase coverage and use of NOAA Weather Radios.	Low	A, B	T, O	Radios procured and distributed. IPAWS (RAVE)	Ongoing
Constructing emergency access roads to dams.	Low	B, E	N/A	In place, regular maintenance.	Ongoing

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## Arenac County Hazard Mitigation Plan 2021

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions J. Terrorism/Sabotage</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	High	A, B, C, D, M, Q, R, S, T	C, Q, T	Some progress.  MSP run, hide, fight program	Continuing to meet w/ owners, mgrs., etc.
Develop a thorough community risk and threat assessments that identifies potential vulnerabilities and targets for a sabotage/terrorism/WMD attack.	High	A, B, C, V	Q, T, V	New program.	Working on plan
Promote alertness, awareness, and monitoring of organizations and activities that may threaten the community.	High	A, B, C, G, M, V	N/A	New area for planning.	Ongoing
Promote consistent use of computer data back-up systems and anti-virus software.	High	A, B, C, D, V	N/A	Increased cyber security at the county level complete 2021 Planned at TWP 2022	Ongoing
Training, planning, and preparedness by local law enforcement and other responders for terrorist/sabotage/WMD attacks.	Med.	A, B, C, D, V	Q, T, V	Some preparation. Continue program.	Ongoing
Establish avenues of reporting information preventing terrorist incidents and sabotage.	Med.	A, B, V	Q, T, V	New program. Local social media platforms	Ongoing
Heighten security at public gatherings, special events, and critical community facilities and industries.	Med.	B, G, M, R, V	Q, T, V	Promote to organizations holding events and law enforcement	Ongoing
Implement school safety and violence prevention programs.	Med.	A, R, V	Q, T, V	Continue established programs.	Ongoing
Promote understanding of and provision for, mental health services in schools, workplaces, and institutions.	Low	A, H, M, R, S	B, C, Q, T	Continue Health and Mental Health Department programs.	Ongoing

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## Arenac County Hazard Mitigation Plan 2021

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions K. Transportation Accidents</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Use improved design, routing, and traffic control at problem roadway areas.	High	E, Q	E, Q, T	Road Commission continue.	Ongoing
Continue training, planning, and preparedness for mass-casualty incidents involving all modes of public transportation.	High	A, B, C, E, V	Q, T	Regular emergency preparedness routines.	Ongoing
Continue railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).	Med.	E, Q	E, Q, T	Regular inspections. Improvements being made.	Ongoing
Provide airport maintenance, security, and safety and airfield emergencies programs and training.	High	A, B, C, D, Q	B, C, Q, T	No airports in the county	
Continue enforcement of designated truck routes, weight, and travel restrictions, and highway speed limits.	Low	E, Q, V	N/A	Enforcing stricter adherence to laws.	Ongoing

<b>Arenac County Implementation Strategy Table</b>					
<b>Mitigation Actions L. Public Health Emergencies</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Funding Sources</b>	<b>Progress</b>	<b>Status</b>
Encourage residents to receive immunizations against communicable diseases.	Med.	H, N, Q, S	H, Q	Progress made.	Ongoing
Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies.	High	H, N, R, S	H, Q, T	Progress made and continue to work on activity. Local social media	Ongoing
Inform public and support pollution control, enforcement and cleanup, proper disposal of chemicals and scrap materials.	Med.	A, B, C, H, M, Q, R	H, Q, T	In place and continuing.	Ongoing
Expand reduced-fee clinics and school health services for the needy.	Med.	B, C, H, N, Q, S	H, Q, T	Continuing to expand programs. Central Mi District Health Dept.	Ongoing
Increase public awareness of radon dangers and the prevention efforts that can be taken to reduce concentrations of radon in homes and buildings.	Low	H, Q	B, G, H	In place.	Ongoing

<b>A. County Emergency Management Office</b>	<b>B. County</b>	<b>C. Local Units of Government</b>
<b>D. Local Fire Departments</b>	<b>E. County Road Commission</b>	<b>F. EMCOG</b>
<b>G. MSU Extension/RC&amp;D</b>	<b>H. District Health Department</b>	<b>I. American Red Cross</b>
<b>J. USFS &amp; MDNR</b>	<b>K. Insurance Companies</b>	<b>L. Real Estate Companies</b>
<b>M. Local Businesses</b>	<b>N. Civic Groups and Churches</b>	<b>O. National Weather Service</b>
<b>P. Utility Companies</b>	<b>Q. State</b>	<b>R. Schools</b>
<b>S. Medical</b>	<b>T. Federal Government</b>	<b>U. Landowners</b>
<b>V. Law Enforcement</b>		

### **Arenac County Repetitive Loss Property Assessment**

A list is maintained by FEMA and the National Flood Insurance Program, identifying properties that have suffered repeated, verified flood losses. The identified properties are potentially eligible to benefit from the Repetitive Flood Claims funds available within the Flood Mitigation Assistance Program (FMAP), with the advantage that a larger portion of the project costs will be covered by federal funds than is normally the case under other Hazard Mitigation Assistance (HMA) grants.

According to the NFIP repetitive loss list as of September 30, 2018, Arenac County has four properties that have been identified for this prioritized flood mitigation assistance. Of the four properties two are in Arenac Township and two more are in Standish Township. None of these four is listed as having its flood risks mitigated. All four are single-family homes and have average flood damages below \$10,000 per event. The two Arenac Township properties had both suffered from flood damages in 1989 and 1990, and one of the two was also damaged in 1984, 1985, and 1986 flood events. This was the property with the largest number of verified flood damages and the largest cumulative amount of damage within the county.

The two Standish Township properties included the only one that is listed as insured, which suffered from floods in 1989 and 1990, and one other property that sustained flood damages in 1991, 1996, and 2004, and had the highest average amount of damages per event. These four properties should all be prioritized for flood mitigation activities. All these properties should be covered by flood insurance.

# Chapter 7

## *Monitoring, Evaluating and Updating*





### **PLAN IMPLEMENTATION**

#### Roles and Responsibilities

The primary entities responsible for implementing the Hazard Mitigation Plan are the Arenac County Board of Commissioners and the Arenac County Emergency Management Director. The Local Emergency Management Committee (LEPC) is organized under the SARA Title III Program and meets on a regular basis to carry out its duties. This plan recommends the committee expand its role to function as the County Hazard Mitigation Committee to oversee implementation of the plan. Roles will need to be defined by the committee and should include establishing an annual work plan, supporting grant writing to seek funding to complete projects, monitoring mitigation activities, evaluating the need for new projects, amending the plan to add new projects and to function as a review body for mitigation grant applications.

County Emergency Management Director  
County Board of Commissioners  
County Sheriff's Department  
Arenac County Departments  
Cities of Standish, Omer and Au Gres, and the townships in Arenac County  
Township, City and Village Fire Departments  
Arenac County Conservation District  
Arenac County Road Commission  
Michigan Department of Natural Resources  
Michigan Department of Environmental Quality  
U.S. Forest Service  
Michigan State University Cooperative Extension Service  
Michigan Department of Agricultural and Rural Development  
Natural Resource Conservation Service  
District Health Department  
American Red Cross  
Insurance Companies  
Real Estate Companies  
Local Businesses  
Civic Groups and Churches  
Federal Emergency Management Administration  
Michigan State Police

#### Process for Monitoring, Evaluating, and Updating

The Arenac County Hazard Mitigation Committee and the Arenac County Emergency Management Director will be responsible for monitoring the implementation of the Mitigation Plan. This may include reviewing reports from agencies involved in implementing projects or activities; having a staff person, who is responsible for overseeing the plan, conducting site visits and meetings concerning mitigation project activities; preparing an annual mitigation activity report for the County Board of Commissioners.

The Arenac County Hazard Mitigation Committee and the Arenac County Emergency Management Director will be responsible for evaluating the effectiveness of the plan.

The evaluation should assess whether:

- The goals and objectives address current and expected conditions.
- The nature, magnitude and/or type of risks that have changed.
- The current resources are appropriate for implementing the plan.
- There are problems with implementation.
- There have been favorable or unfavorable outcomes
- Agencies and other partners participated as expected.

The Disaster Mitigation Act (DMA) of 2000 requires the Arenac County Hazard Mitigation Plan be updated every five years. This may include updating community profiles, examining goals, redoing the hazard analysis and revisiting the project list. To properly update the plan, Arenac County will need to seek funding from appropriate state and federal agencies. It may be necessary to examine the plan each year and as projects are completed and new mitigation projects are identified. Local units of government, county departments, and local, state, and federal agencies will have the ability to propose and sponsor projects from the hazard mitigation plan. Any plan update would require public comment, county approval, local jurisdictional approval if projects are located or proposed in a particular township, and approval by the State of Michigan and FEMA.

### Process to Incorporate into Local Planning Activities

Arenac County and its cities, village and townships, as well as local and state agencies will consider integrating information from the Hazard Mitigation plan into their prospective comprehensive and operations plans. Land use planning and zoning is administered at the county, city, and township level. As a part of the education and outreach aspect of the hazard mitigation effort, communities will be encouraged to incorporate hazard mitigation planning into their respective comprehensive planning and capital improvements planning and adopt zoning regulations that will minimize effects of hazards. The Arenac County Hazard Mitigation Plan will be considered and analyzed by local officials when updating local plans, such as master plans and recreation plans. After the Hazard Mitigation Plan is considered and analyzed, the appropriate actions and requirements will be incorporated into other plans.

### Ongoing Public Participation

Arenac County is committed to involving the public in the implementing and updating of the Hazard Mitigation Plan. Copies of the plan will be available at county libraries, county clerk's office and all county municipality offices. The plan contains the address and phone number of the Emergency Management Office which will be responsible for keeping a record of public comments on the plan.

Copies of the plan will be posted on the county web site. The web page will contain the mailing address, phone number and email address of the appropriate contact persons.

During the update process of the Hazard Mitigation Plan, the committee will advertise and facilitate public meetings to obtain input and guidance from the general public, businesses, county municipalities, and agencies. A notice will be posted to advertise any meeting of the Hazard Mitigation Committee where the committee is reviewing or updating the mitigation plan.

## Chapter 8 *Review & Adoption of the Mitigation Plan*



## **Approval Process**

### Public Review and Comment

Several avenues were used to disseminate the draft plan for public review and comment. The draft Arenac County Hazard Mitigation Plan was electronically conveyed to each local municipality. Draft copies were sent at the Mary Johnston Library in Stand the Au Gres Library and in the County Clerk's office. The draft plan was posted on the county's web site.

A presentation was made to the Arenac County Chapter of the Michigan Township Association. The purpose of the presentation was to describe the hazard mitigation planning process, conclusions, and recommended actions. Townships and municipalities were asked to adopt the plan at their next township board, city, or village meetings.

### Approval

The Arenac County Hazard Mitigation Plan was presented to the Arenac County Board of Commissioners at their regular monthly meeting on October 8, 2019. The purpose of the presentation was to describe the planning process, conclusions, and recommended actions. The Arenac County Board of Commissioners approved the Hazard Mitigation plan on October 8, 2019. A copy of the resolution is reproduced at the end of this chapter.

# RESOLUTION

## Arenac County Board of Commissioners

Standish, Michigan

Resolution No. 2019-12

A resolution of the Arenac County Board of Commissioners adopting the *2019 Arenac County Hazard Mitigation Plan*.

Whereas, The Arenac County Board of Commissioners recognizes the threat that natural hazards pose to people and property within Arenac County; and

Whereas, Arenac County has prepared a multi-hazard plan, hereby known as the *2019 Arenac County Hazard Mitigation Plan* in accordance with the Disaster Mitigation Act of 2000; and

Whereas, the *2019 Hazard Mitigation Plan* identifies mitigation goals and actions to reduce or to eliminate long-term risk to people and property in Arenac County from the impacts of future hazards and disasters; and

Whereas, adoption of the Plan by the Arenac County Board of Commissioners demonstrates our commitment to the hazard mitigation and the achievement of the goals outlined in the *2019 Arenac County Hazard Mitigation Plan*.

Now Therefore, Be it Resolved that the Arenac County Board of Commissioners of the State of Michigan does hereby adopt the *2019 Arenac County Hazard Mitigation Plan* as an official plan of Arenac County this 8<sup>th</sup> day of October 2019.

Motion to approve by: MS. Burke, 2nd by MS. Salgat

Ayes Mrozinski, Salgat, Burke, Woolhiser, Kroczyaleski

Nays NONE

Absent NONE

I hereby certify that the foregoing is a true copy of a resolution adopted at a regular meeting of the Arenac County Board of Commissioners held on Tuesday, October 8<sup>th</sup>, 2019, and that the said meeting minutes are on file in the office of the Arenac County Clerk and are available for inspection.



Ricky R. Rockwell, Arenac County Clerk

  
Shertlyn M-S Burkhardt, Chief Deputy County Clerk



# Appendix

## 2016/17 Arenac County Hazard Mitigation Plan Municipal Questionnaire Results & Summary

Surveys and memoranda were sent to all Arenac County municipalities. Below are the results and summary of the municipal questionnaire.

### 9. Does your community have large seasonal shifts in population?

#### Summary:

Adams Township – No

Arenac Township – Yes

Au Gres Township – Yes

City of Au Gres – Yes

City of Omer – Yes but not large; some snowbirds return in the spring and have campground and canoeing all around and through the city.

City of Standish – No

Clayton Township – No

Deep River Township – “Notable” Seasonal residents and campgrounds.

Lincoln Township – No. A few snowbirds.

Mason Township – No (deer season hunters but not significant)

Moffatt Township – Yes

Sims Township – Yes

Standish Township – Yes

Turner Township – No

Village of Sterling – No

Village of Turner – No

Village of Twining – No

Whitney Township – Yes. Snowbirds and others.

### What are the changes in increases or decreases?

#### Summary:

Adams Township – N/A

Arenac Township – Perhaps double

Au Gres Township – +/- 25%

City of Au Gres – Population increases up to 20%; US-23 traffic increases dramatically.

City of Omer – Approximately +/- 10% of the population.

City of Standish – N/A

Clayton Township – +/- 5%

Deep River Township – +/- 200 seasonal.

Lincoln Township – N/A

Mason Township – N/A

Moffatt Township – 50%

Sims Township – Population 1100

Standish Township – 30%



Turner Township – Summer traffic on M-65.  
Village of Sterling – +/- 5%  
Village of Turner – N/A  
Village of Twining – N/A  
Whitney Township – Up to 10x population in the summer.

**At what time of the year do population changes occur?**

**Summary:**

Adams Township – N/A  
Arenac Township – Spring fishing, summer campgrounds, canoe liveries, and tourism through fall with hunting.  
Au Gres Township – Summer and some in the fall  
City of Au Gres – Spring through fall.  
City of Omer – Spring and fall.  
City of Standish – N/A  
Clayton Township – Fall and spring.  
Deep River Township – Mainly in the summer.  
Lincoln Township – Spring and fall.  
Mason Township – N/A  
Moffatt Township – Summer  
Sims Township – Spring, summer, and fall.  
Standish Township – Summer (March – October)  
Turner Township – Deer season.  
Village of Sterling – Lower in winter/higher in summer  
Village of Turner – N/A  
Village of Twining – N/A  
Whitney Township – Spring, summer, and fall.

**10. Are there a significant number of seasonal homes in the community?**

**Summary:**

Adams Township – No  
Arenac Township – Not significant.  
Au Gres Township – Yes  
City of Au Gres – Yes  
City of Omer – No  
City of Standish – No  
Clayton Township – Did not answer.  
Deep River Township – Not significant.  
Lincoln Township – No  
Mason Township – No  
Moffatt Township - Yes  
Sims Township – Yes  
Standish Township – Seasonal homes have decreased but still significant. A number of campgrounds.  
Turner Township – No

Village of Sterling – No  
Village of Turner – No  
Village of Twining – No  
Whitney Township – Yes.

**11. Do large numbers of people come to your community to hunt, fish, snowmobile, camp, etc.?**

**Summary:**

Adams Township – Some  
Arenac Township – Yes  
Au Gres Township – Yes; two campgrounds.  
City of Au Gres – Yes  
City of Omer – Not large but significant numbers; camping, kayaking, canoeing, fishing, and hunting.  
City of Standish – Yes; thousands pass through on US-23 and the community is surrounded by campgrounds.  
Clayton Township – Did not answer.  
Deep River Township – Deer hunting and campgrounds in the summer and fall.  
Lincoln Township – Two hunt clubs, hunters, and a small campground.  
Mason Township – No  
Moffatt Township – Yes and transient from I-75 and RR-33.  
Sims Township – Yes  
Standish Township – Camping and fishing  
Turner Township – Deer hunting.  
Village of Sterling – No  
Village of Turner – No  
Village of Twining – No. Lots of people pass through town on M-65.  
Whitney Township – Some. Brown RV Park and motel. There are a lot of forest areas in the western part of the township. Not a lot of people snowmobile in the area.

**12. Are there any annual events held in the community that attract large numbers of people? If so, describe the event(s), location, dates and approximate attendance.**

**Summary:**

Adams Township – No  
Arenac Township – Sucker Festival in Omer and Mud Bogs at campground.  
Au Gres Township – Not in the township; the City of Au Gres has some such as the Walleye Tournament.  
City of Au Gres – Car show, Halloween, one tournament, fishing tournaments, and county fireworks.  
City of Omer – Fish Run and Sucker Derby in April on the Rifle River.  
City of Standish – Depot Days, county fair, and car show.  
Clayton Township – No  
Deep River Township – Deer Season.

Lincoln Township – Ball diamond events (100+) and ball tournaments daily in the summer (May – August).

Mason Township – No

Moffatt Township – Forest Lake Music Festival (150 people) and Forest Lake Summer Picnic (400-600 people).

Sims Township – No

Standish Township – No, but casino has large number of patrons daily. Pow Wow at casino in the summer has high attendance.

Turner Township – None.

Village of Sterling – Sterling Health Center hold annual health fair in area in the late summer with attendance in the hundreds.

Village of Turner – Annual Christmas party. Party second week of December at the Village Hall. Approximately 50 people attend.

Village of Twining – No

Whitney Township – No (but in Tawas and Au Gres)

13. **Please rate the following natural hazards each 1-10, with 1 being a low threat to your community and 10 a high threat. Hazards are considered events that can cause death or injury, damage property or the environment, or disrupt business or services.**

**Wildfire –**

Adams Township – 2

Arenac Township – 10

Au Gres Township – 2

City of Au Gres – 1

City of Omer – 5

City of Standish – 1

Clayton Township – 7

Deep River Township – 9 (a lot of woods and forests in the township)

Lincoln Township – 5

Mason Township – 8

Moffatt Township – 10

Sims Township – 7

Standish Township – 4

Turner Township – 8

Village of Sterling – 3

Village of Turner – 5

Village of Twining – 1

Whitney Township – 5 (peat farms and woods)

**Tornado –**

Adams Township – 2

Arenac Township – 7

Au Gres Township – 7

City of Au Gres – 2  
City of Omer – 5  
City of Standish – 5  
Clayton Township – 4  
Deep River Township – 3  
Lincoln Township – 4  
Mason Township – 4  
Moffatt Township – 5  
Sims Township – 2  
Standish Township – 2  
Turner Township – 3  
Village of Sterling – 5  
Village of Turner – 7  
Village of Twining – 3  
Whitney Township – 3

**Flood (River/Lake Shoreline) –**

Adams Township – 1 (only 1 house in floodplain)  
Arenac Township – 10  
Au Gres Township – 7 (in the spring)  
City of Au Gres – 1  
City of Omer – 9  
City of Standish – 3  
Clayton Township – 1  
Deep River Township – 9 (Rifle River)  
Lincoln Township – 2 (Pine River and Melita Road bridge just past South 23)  
Mason Township – 1  
Moffatt Township – 2 (rivers in deep valleys)  
Sims Township – 3  
Standish Township – 7 (Nor'easters very powerful and erode shore banks and flood homes)  
Turner Township – 9 (rivers and drains; drains two counties north)  
Village of Sterling – 4  
Village of Turner – 7 (all farms drain into creek; no storm sewers; clay soils)  
Village of Twining – 1  
Whitney Township – 4 (good drainage system. Whitney drains has erosion problems-Turner Road culvers and banks of Whitney Drain)

**Severe Wind –**

Adams Township – 8  
Arenac Township – 8  
Au Gres Township –  
9 City of Au Gres – 4  
City of Omer – 8  
City of Standish – 8  
Clayton Township – 4

Deep River Township – 8  
Lincoln Township – 7  
Mason Township – 8  
Moffatt Township – 7  
Sims Township – 8  
Standish Township – 10  
Turner Township – 8  
Village of Sterling – 8  
Village of Turner – 7  
Village of Twining – 6 (surrounded by farmland)  
Whitney Township – 5 (northeasters with ice and many dead ash trees throughout the township)

**Winter Weather Hazards –**

Adams Township – 3  
Arenac Township – 8  
Au Gres Township – 8  
City of Au Gres – 4  
City of Omer – 8  
City of Standish – 7  
Clayton Township – 3  
Deep River Township – 5 (Village of Sterling sewage ponds leakage)  
Lincoln Township – 8 (I-75)  
Mason Township – 5  
Moffatt Township – 5 (steep pitch roofs above M-55)  
Sims Township – 5  
Standish Township – 7  
Turner Township – 5  
Village of Sterling – 8  
Village of Turner – 7 (winter storm drifting)  
Village of Twining – 7  
Whitney Township – 5

**Thunderstorm (Lightning/Hail) –**

Adams Township – 5  
Arenac Township – 8  
Au Gres Township – 8  
City of Au Gres – 4  
City of Omer – 8  
City of Standish – 6  
Clayton Township – 2  
Deep River Township – 8  
Lincoln Township – 8  
Mason Township – 8  
Moffatt Township – 7  
Sims Township – 8

Standish Township – 8  
Turner Township – 7  
Village of Sterling – 8  
Village of Turner – 7  
Village of Twining – 6  
Whitney Township – 5

**Earthquakes –**

Adams Township – 1  
Arenac Township – 1  
Au Gres Township –  
1 City of Au Gres – 1  
City of Omer – 1  
City of Standish – 1  
Clayton Township – 1  
Deep River Township – 1  
Lincoln Township – 1  
Mason Township – 0  
Moffatt Township – 1  
Sims Township – 1  
Standish Township – 2  
Turner Township – 1  
Village of Sterling – 1  
Village of Turner – 2  
Village of Twining – 1  
Whitney Township – 1 (icequakes in winter)

**Drought –**

Adams Township – 2  
Arenac Township – 5  
Au Gres Township – 5  
City of Au Gres – 1  
City of Omer – 1  
City of Standish – 1  
Clayton Township – 3  
Deep River Township – 3  
Lincoln Township – 3  
Mason Township – 3  
Moffatt Township – 1 (7 streams going into Forest Lake)  
Sims Township – 3  
Standish Township – 6  
Turner Township – 7  
Village of Sterling – 7  
Village of Turner – 5  
Village of Twining – 1  
Whitney Township – 3

**Extreme Temperatures –**

- Adams Township – 2
- Arenac Township – 5
- Au Gres Township – 2
- City of Au Gres – 3
- City of Omer – 6
- City of Standish – 7
- Clayton Township – 3
- Deep River Township – 5 (cold not hot)
- Lincoln Township – 5
- Mason Township – 5
- Moffatt Township – 2
- Sims Township – 3
- Standish Township – 6
- Turner Township – 6
- Village of Sterling – 7
- Village of Turner – 7
- Village of Twining – 6 (extreme cold; floor heavings; storm drains frozen)
- Whitney Township – 4

- 14. Please rate the following social or technological hazards each 1-10, with 1 being a low threat to your community and 10 a high threat.**

**Public Health Emergencies –**

- Adams Township – 1
- Arenac Township – 5
- Au Gres Township – 4
- City of Au Gres – 2
- City of Omer – 7
- City of Standish – 5
- Clayton Township – 4 (whooping cough)
- Deep River Township – 2 (two schools in township)
- Lincoln Township – 2
- Mason Township – 1
- Moffatt Township – 2 (1 small foster care home – 6-8 people)
- Sims Township – 2 (E. coli beach incidents)
- Standish Township – 2
- Turner Township – 3
- Village of Sterling – 3
- Village of Turner – 2
- Village of Twining – 5 (school in town)
- Whitney Township – 6 (E. coli at beaches)

**Structural Fires –**

Adams Township – 1  
Arenac Township – 7  
Au Gres Township – 1  
City of Au Gres – 3  
City of Omer – 6  
City of Standish – 2  
Clayton Township – 4  
Deep River Township – 3  
Lincoln Township – 5  
Mason Township – 5  
Moffatt Township – 2 (most construction modern)  
Sims Township – 3 (fire department mutual aid)  
Standish Township – 3  
Turner Township – 6  
Village of Sterling – 5  
Village of Turner – 5  
Village of Twining – 8 (many older structures)  
Whitney Township – 6

**Oil and Gas Well Accidents –**

Adams Township – 5 (+/- 24 active wells)  
Arenac Township – 7 (Consumer Gas line)  
Au Gres Township – 5  
City of Au Gres – 1 (gas pipeline on city border with township)  
City of Omer – 2 (natural gas pipeline)  
City of Standish – 1 (natural gas pipeline)  
Clayton Township – 3 (DTE gas line in township)  
Deep River Township – 8  
Lincoln Township – 4 (gas lines M-61 and US-23)  
Mason Township – 1  
Moffatt Township – 8 (1 oil well, pipeline, and Enbridge #5)  
Sims Township – 2 (oil wells capped)  
Standish Township – 2 (gas well in Lincoln Township at border with township)  
Turner Township – 7 (have number of oil wells; one major)  
Village of Sterling – 3  
Village of Turner – N/A  
Village of Twining – 3 (C/E line on M-65)  
Whitney Township – 9 (natural gas lines on US-23)

**Civil Disturbances –**

Adams Township – 1  
Arenac Township – 1  
Au Gres Township – 1  
City of Au Gres – 1  
City of Omer – 1



City of Standish – 1  
Clayton Township – 1  
Deep River Township – 1  
Lincoln Township – 4  
Mason Township – 1  
Moffatt Township – 1  
Sims Township – 1  
Standish Township – 8  
Turner Township – 1  
Village of Sterling – 2  
Village of Turner – 2  
Village of Twining – 1  
Whitney Township – 1

**Infrastructure Failure –**

Adams Township – 5 (many power outages)  
Arenac Township – 8 (dead ash trees falling on electrical lines)  
Au Gres Township – 5 (2 critical bridges and some culverts need to be replaced)  
City of Au Gres – 4 (sewer lines very old)  
City of Omer – 7  
City of Standish – 7  
Clayton Township – 2  
Deep River Township – 8  
Lincoln Township – 3  
Mason Township – 1  
Moffatt Township – 1 (all transmission lines in danger of trees falling – dead ash trees)  
Sims Township – 2  
Standish Township – 8  
Turner Township – 10 (drains, roads, culverts, box bridges, ash trees falling on power lines, and damming rivers)  
Village of Sterling – 7  
Village of Turner – 6 (storm sewers over 50 years old; street drains)  
Village of Twining – 8 (storm and storm sewer)  
Whitney Township – 5 (Turner Road, Whitney Drain, water system, and towers)

**Dam Failure –**

Adams Township – N/A  
Arenac Township – 4 (Forest Lake Dam)  
Au Gres Township – N/a  
City of Au Gres – 1  
City of Omer – 8 (dam on Forest Lake northwest of the city)  
City of Standish – N/A  
Clayton Township – 1  
Deep River Township – 6 (Forest Lake Dam failure possible and control levels)  
Lincoln Township – 1

Mason Township – 1  
Moffatt Township – 2  
Sims Township – 1  
Standish Township – 1 (no dams in township)  
Turner Township – 1  
Village of Sterling – 1  
Village of Turner – N/A  
Village of Twining – 1  
Whitney Township – 1

**Hazardous Material Incidents –**

Adams Township – 4 (I-75 and Old 76; “cow manure”; large farms in and around)  
Arenac Township – 8 (US-23, State Road, Lake State RR, and M-65)  
Au Gres Township – 5  
City of Au Gres – 5 (US-23 hazardous materials transport)  
City of Omer – 8 (US-23)  
City of Standish – 8 (all hazardous materials to Northeast Michigan go through Standish)  
Clayton Township – 2 (from diesel fuel tankers and storage)  
Deep River Township – 9 (M-76, I-75, and M-33)  
Lincoln Township – 8 (Helena Charm (fertilizer), Ferrell Gas, Andersons Elevator (fertilizer and grains), SERA Title III Site, and Railroad.  
Mason Township – 6  
Moffatt Township – 9 (service station, farmers, and I-75)  
Sims Township – 6 (lakeshore transport accidents)  
Standish Township – 8 (propane sales and farmers)  
Turner Township – 8 (M-65 and Great Lake Railroad)  
Village of Sterling – 6  
Village of Turner – 7 (farm operations and elevator)  
Village of Twining – 9 (propane; transport on M-65; storage)  
Whitney Township – 6 (US-23 is a main transportation route for Northeast Michigan; accidents on US-23 due to fuel transport; recent spills of 4,000 gallons of gas; Saginaw-Midland Water Plant acids at water plant for backwash)

**Air, Land, or Water Transportation Accidents –**

Adams Township – 3 (I-75 and Old 76)  
Arenac Township – 8 (land)  
Au Gres Township – 8  
City of Au Gres – 5 (boating accidents, fishing, etc.)  
City of Omer – 9 (land)  
City of Standish – 8 (I-75, US-23, M-65, and M-61)  
Clayton Township – 2  
Deep River Township – 9  
Lincoln Township – 8  
Mason Township – 6  
Moffatt Township – 7 (hazard materials; I-75, Maple Road, and M-33)

Sims Township – 8 (US-23 transports)  
Standish Township – 8 (US-23 / M-13)  
Turner Township – 8 (M-65, disposal wells, and new oil well proposed recently)  
Village of Sterling – 7  
Village of Turner – 7 (farmland chemicals; hazardous materials trucks; Class A, Maple Ridge is a Class A road and short cut across county I-75 to US-23; sugar beets)  
Village of Twining – 8 (Lake State Railroad; degraded not allowed to carry hazard materials.  
Whitney Township – 6 (Big Charity Island from Browns Landing; routes to hospitals; helicopter routes over township)

**Terrorism/Sabotage –**

Adams Township – 1  
Arenac Township – 7 (“Operation Stone Garden”; illegal transportation of goods and people across the lake)  
Au Gres Township – 8  
City of Au Gres – 1  
City of Omer – 2  
City of Standish – 1 (but high potential for computer hacking, drone attacks at water plants, hazardous material storage sites, propane storage, etc.)  
Clayton Township – 1  
Deep River Township – 1  
Lincoln Township – 3 (US-23 and I-75)  
Mason Township – 1  
Moffatt Township – 1  
Sims Township – 1  
Standish Township – 3 (Saginaw Bay shoreline vulnerability)  
Turner Township – 2  
Village of Sterling – 2  
Village of Turner – 1  
Village of Twining – 2  
Whitney Township – 2 (water plant)

**15. What type of specific hazard (social, natural, or technological) do you think your community is least prepared for? Why?**

**Summary:**

Adams Township – Sabotage  
Arenac Township – Transportation of hazardous materials and infrastructure failures.  
Au Gres Township – Tornadoes, meth labs and other hazardous materials, and sabotage.  
City of Au Gres – Terrorist act.  
City of Omer – Hazard materials accident.  
City of Standish – Unguarded water plants and hazardous material storage sites.  
Clayton Township – Earthquakes, tornadoes, and hazardous material incidents.  
Deep River Township – Hazard material spills.

Lincoln Township – Sabotage and civil disturbance.  
Mason Township – Chemical spills and hazard materials.  
Moffatt Township – Large forest fires.  
Sims Township – Earthquakes  
Standish Township – Tornadoes and terrorism.  
Turner Township – Transit accidents and hazardous materials.  
Village of Sterling – Chemical spills.  
Village of Turner – Elevator fire.  
Village of Twining – Terrorism.  
Whitney Township – Terrorism and severe storms.

**Why are you not prepared?**

Adams Township – N/A  
Arenac Township – Not sufficient training or equipment.  
Au Gres Township – N/A  
City of Au Gres – Believe they are not prepared but believe an even to be unlikely;  
Au Gres water supply vulnerable-Saginaw-Midland water supply intakes are the number 1 risk in the county.  
City of Omer – Not sufficient equipment to address possible situations.  
City of Standish – Not prepared for physical or computer attacks.  
Clayton Township – Did not answer.  
Deep River Township – Least prepared and most risk.  
Lincoln Township – Not prepared.  
Mason Township – M-65 Lake States Railroad and Maple Ridge now Class A roads.  
Moffatt Township – A lot of Jack Pines and fires are difficult to fight.  
Sims Township – Not prepared.  
Standish Township – Least expected and not prepared  
Turner Township – Not sufficient equipment to fight.  
Village of Sterling – Not prepared.  
Village of Turner – Twining is nearest fire department 3 miles away)  
Village of Twining – No police department; civil disturbances; not prepared.  
Whitney Township – Most other things they are prepared for.

**16. What type of specific hazard (social, natural, or technological) do you feel your community is best prepared for? Why?**

**Summary:**

Adams Township – Structure fires and grass fires.  
Arenac Township – Structural fires and civil disturbances.  
Au Gres Township – Structural fires and wildfires.  
City of Au Gres – Structural fires.  
City of Omer – Structural fires.  
City of Standish – Industrial/manufacturing (Magline and Vantage) structural or hazardous materials.  
Clayton Township – Structural fires.  
Deep River Township – Wildfire and structural fires.  
Lincoln Township – Structural fires.

Mason Township – Wildfires.  
Moffatt Township – Structural fires.  
Sims Township – Structural fires.  
Standish Township – Wildfires and structural fires.  
Turner Township – Wildfires and structural fires.  
Village of Sterling – All fire types.  
Village of Turner – Can live through extreme temperatures.  
Village of Twining – Structural fires.  
Whitney Township – Wildfires, structural fires, and meth labs.

**Why are you prepared?**

Adams Township – Good fire department 3 miles away and DNR fire fighters are prepared and good.  
Arenac Township – Have a good fire department. Have an excellent sheriff’s department. Township hall is a Red Cross shelter but needs a generator.  
Au Gres Township – N/A  
City of Au Gres – Have an excellent fire department.  
City of Omer – Good fire department and arrangements with surrounding communities.  
City of Standish – Fire departments are trained and equipped for these threats.  
Clayton Township – Sterling Fire Department is well trained and prepared.  
Deep River Township – “Fire department rocks”  
Lincoln Township – Have a good fire department.  
Mason Township – Good readiness and cooperation by Department of Natural Resources and local fire departments.  
Moffatt Township – Good communication with residents, good coordination, good fire department, good material assistance, etc.)  
Sims Township – Very good fire department and mutual aid with other Arenac County fire departments.  
Standish Township – Good fire department and mutual aid agreements with city and other communities.  
Turner Township – Excellent fire department.  
Village of Sterling – Good fire department.  
Village of Turner – N/A  
Village of Twining – Good fire department and mutual aid.  
Whitney Township – Have great fire departments in Tawas, Twining, Standish, Au Gres, and the State Police and U.S. Department of Justice to do the cleanup.

17. **Important: This information is also a requirement to receive funding in the event of a disaster. What types of initiatives, projects, mitigation strategies, improvements or efforts (i.e., public education, training, equipment, programs, communications, etc.) do you think could be implemented that would help reduce your community’s vulnerability to specific hazards? (Please state specifics and list as many as you can)**

**Summary:**

- Adams Township –
- Arenac Township –
- Au Gres Township –
- City of Au Gres –
- City of Omer –
- City of Standish –
- Clayton Township –
- Deep River Township –
- Lincoln Township –
- Mason Township –
- Moffatt Township –
- Sims Township –
- Standish Township –
- Turner Township –
- Village of Sterling –
- Village of Turner –
- Village of Twining –
- Whitney Township –

**To be answered later with Emergency Management Director and LPT Committee.**

**Mason Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
November 1, 2016**

Attendees:

Mark Heideman, Supervisor, Darlene Janish, Clerk, Paul Phelan, Trustee, Shelly Everitt, Treasurer, Randy Gates, Trustee, Bob Townsend Resident, Jeff Piar, Resident. Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates. Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

**Au Gres Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
November 10, 2016 @ 7 p.m.**

Attendees:

Tom Pawlaczyk, Supervisor, Michael Oxley, Clerk, Josie Corey, Treasurer, James Herzog, Trustee, Gerald Willett, Trustee, Patty Herzog, Resident, Bill Gilbert, Resident, Jan Gilbert, Resident, Joann Grelau, Resident, and Damel Monroe, Resident.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates. Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Mr. Rohn discussed the three sirens he had attained funding for that would be installed in the near future in the three cities of the county – Standish, Au Gres, and Omer.

Mr. Rohn also discussed the “Operation Stonegarden” that is addressing border control along the Saginaw Bay coast. There are two harbors, one in Arenac County and one in Iosco County, where large watercraft can come into the United States from Canada or elsewhere.

Mr. Hamilton discussed FEMA’s intent that climate change be examined in the Hazard Mitigation Plan. He suggested that while the Au Gres Township is revising its Master Plan that the planning commission review community resilience and adaption in regard to climate change.

**City of Standish  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
November 21, 2016 @ 6 p.m.**

Attendees:

Jerry Nelson, City Manager, Ray Koroleski, Mayor, Violet Cook, Council Member, Mark Spencer, Council Member, Tosha Tunney, Council Member, Josette Rang, Council Member, Charlie Macaulay, Council Member, Peggy Burtch, Clerk/Treasurer, Brandon Dickhauser, City of Standish, Dennis Whitney, City of Standish, Curt Hillman, City of Standish, Tim Barnum, Arenac Independent, Mark Polczinski, Resident.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Mr. Rohn discussed the warning siren he has acquired funding for that will be located in the City of Standish. It should be installed by late spring in 2017. Council members and city manager expressed interest in attending Hazard Mitigation Planning Commission meetings.



**City of Omer  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
November 22, 2016 @ 7 p.m.**

Attendees:

Sue Oliver, City Clerk, Barbara Wayman, Council Member, Daniel Raushi, Council Member, Clark Sanford, Council Member, Ruth Ann Cook, Mayor, Jeff Trombley, Arenac County Commissioner, Glen Rice, Resident, Robin Berry, Council Member, Debra Rice, Resident, Ben Keeley, Resident, Jerry Ott, Resident.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates. Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Mr. Rohn Discussed the warning siren he has garnered for the City of Omer and when it is to be installed, and necessary electrical connections to city hall. A number of council members expressed interest in attending the Hazard Mitigation Planning Committee meetings.

**Arenac Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Thursday, December 1, 2016 @ 6 p.m.**

Attendees:

Cindy Halamar, Clerk, Heather Bauman, Deputy Clerk, Glen Rice, resident, Jeff Trombley, County Commissioner, Jessica Williams, Assessor, Brenda Matt, Zoning Administrator, Renee Earhart, Deputy Treasurer, Jessica Dudley, resident, Todd Mertine, resident, Debra Rice, Treasurer, Tim Hagley, Supervisor, Allen Osier, Trustee, Joe Carruthers, Trustee, and Dave Childs, resident.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by

Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Ed Rohn discussed sirens he has procured funding for in Standish, Au Gres, and Omer (Omer siren in Arenac Township) (\$85k grant for all this). He indicated there may possibly be sirens for Sims and Whitney Townships.

Mr. Hamilton noted that “community resiliency” should be included in master plan work underway in township.

**Village of Turner  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Monday, December 5, 2016 @ 4:30 p.m.**

Attendees:

Matt Montney, Trustee, Clyde Aikens, Trustee, Angie Beardsley, Trustee, Debbie Bates, Treasurer, Jodi Aikens, Clerk, and Gary Bates, President.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

The situation of the village was discussed. The quality of the water is very poor, very hard with much iron in it. The only business left in town is the elevator on the railroad line. There are numerous vacant buildings throughout the town. Large farms surround the village with some wood lots at the boundaries.

Two members of the council signed up to attend the Hazard Mitigation Planning Commission meetings.

**City of Au Gres  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Tuesday, December 6, 2016 @ 7 p.m.**

Attendees:

John Stanley, City Manager, LaVonne Pritchard, Clerk, William Borushko, Mayor, Keith Edmonds, Mayor Pro-tem, Frances Richards, Resident, Stacie Briggs, Resident, Linda Proulx, Resident, Lynn Proulx, Resident, Dale Nelson, Resident, Joe Warr, City Council, Tim Edwards, City Council, and Bob Proulx, City Council.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard

Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed, and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Mr. Rohn discussed the sirens for which he has obtained funding, one of which will be installed in Au Gres.

Members of the council expressed interest in attending the Hazard Mitigation Planning meetings and asked if Ed would attend the upcoming Au Gres Fire Board meeting.

**Lincoln Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Thursday, December 8, 2016 @ 7 p.m.**

Attendees:

David Hertzberg, Supervisor, Judy Bell, Treasurer, Ardith Demo, Clerk, Marcella Ruszala, Trustee, Noreen Walter, Trustee.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by

Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Much discussion was had regarding the township's situation surrounding the City of Standish and the township assets on the border of the city. Although limited, Lincoln Township has most of the same hazards and risks as the city. It was noted that the state prison within the township is currently closed. Township members expressed interest in participating in the project.

**Clayton Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Monday, December 12, 2016 @ 7 p.m.**

Attendees:

Raymond Daniels, Supervisor, Byron Fogarasi, Clerk, Patricia Berry, Treasurer, Victor Daniels Jr., Trustee, Sandra Bowen, Trustee, William Blackmore, Zoning Administrator, Mary Wojtowicz, Assessor, Dave Bone, Resident, Ron Klamerus, Resident, Shirley Burtik, Resident, Betty Berry, Resident, Cathy Keeley, Resident, John Holburger, Resident, Craig Berry, Resident, Laiken Whitney, Resident, Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates. Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

As the questionnaire answers have indicated, Clayton Township has relatively free hazards. There are no major creeks, not too many wooded areas, and little developed property within the township. There are however a number of campgrounds associates with the Rifle River just outside the township.

**Whitney Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Tuesday, December 13, 2016 @ 7 p.m.**

Attendees:

Donald Becker, Supervisor, Kimberly Anderson, Clerk, John Gehris, Treasurer, Scott McAlindon, Trustee, Francis Semenick, Trustee, Marie Piotrowski, Resident, Bob Bench, Resident, and Carol Gehris, Resident.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Much discussion occurred regarding the Saginaw-Midland Water Authority facility on Lake Huron. Mr. Rohn indicated that the security of this facility is his major concern in the county. There was discussion about the siren at the facility and when and whether the siren is tested and who knows about it and whether there are tests and what should be done if the siren sounds. There was also discussion about meth labs and marijuana growing in the township. Mr. Rohn indicated which agencies were responsible, and qualified and prepared, to deal with these issues. He also spoke about Operation Stone Garden (border control).

**Moffatt Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Monday, December 19, 2016 @ 7 p.m.**

Attendees:

Dennis Spencer, Supervisor, Allison Chmielewski, Clerk, Lee Chard, Trustee, Lenny Mezey, Trustee, Kevin Kaczmarek, Treasurer, Rick Kalosis, Resident, Kathy Fender, Resident, Alyce Oertel, Resident, Gary Jeffery, Resident, Sam Daughterman, Resident, Pat Jedrzeczyk, Moffatt Township Constable, Bob Chmielewski, Tammy Spencer, Dennis Monsere, Resident, Marion Chard, Resident, Jack Dunn, Resident, Blair Dyer, Arenac County Road Commission, Ken Stawowy, Arenac County Road Commission, Barbara Eichman, Resident, and Annie Kaczmarek.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Mr. Rohn discussed various hazard materials that are transported on I-75, Old M76, and Maple Ridge Road (a Class A road) and the dam on the Rifle River at Forest Lake. Members of the board and residents expressed interest in participating in the Hazard Mitigation Plan process.

**Sims Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Tuesday, December 20, 2016 @ 7 p.m.**

Attendees:

Bob Mackie, Supervisor, Judy Mackie, Clerk, Sharon Boensch, Treasurer, Ernest Kata, Zoning Administrator, Barb, Board Member, Mike Deleo, Trustee, Sam Proulx, Trustee, June, Deputy, Marci, Deputy, Noreen, Deputy, Mike Engels, Michigan Rural Water Association, Darrick Huff, Spicer Group, Dale Radka, Resident, Marci Prueter, Resident, Dennis Klein, Resident, Stan Kuffmulle, Resident, Art Williams, Resident, Bev Williams, Resident, Doug Juras, Resident, Jean Dean, Resident, Ronald Hata, Resident, Bob Bench, Resident.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Mr. Rohn discussed hazards and risks within Sims Township. It was noted that the township has a long border on Lake Huron and could be vulnerable both to crossings from Canada and to freighter transports. Although the Saginaw-Midland Water Plant is in Whitney Township, the vulnerability of the plant and the water intakes in Lake Huron were discussed.

**Village of Twining  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Wednesday, December 21, 2016 @ 7 p.m.**

Attendees:

Donald Ferguson, President, Carol Norton, Clerk, Tom Norton, Street Administrator, Chad Schumacher, Trustee, Tina Lammy Trustee, Steven Kramer, Trustee, Gloria Ruttenberg, Trustee.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

The Village of Twining is surrounded by farmland with few wind breaks leaving it vulnerable to severe winds. Discussed the number of tourists and transport vehicles passing through town on M65 which bisects the village. Discussed village infrastructure, i.e., sanitary and storm sewers. Although the village has no hunting areas or fishing sites, many people pass through town going to the numerous areas that are north, east, and west of the village.

**Turner Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Monday, January 23, 2017 @ 7 p.m.**

Attendees:

Jeremy Gates, Supervisor, Denise Gates, Clerk, Patricia Koons, Treasurer, Herb Keeley, Trustee, Stacey Keeven, Trustee, Doreen Dewald, Assessor, Chad Schumacher, Resident, and Roger Peter, Board of Review.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by

Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Turner Township has a number of operating oil wells and some disposal wells. It also has many creeks and drains going through the township which are subject to flooding.

**Deep River Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Tuesday, January 10, 2017 @ 7 p.m.**

Attendees:

Karlia Kroczaleski-Raymond, Supervisor, Ann Marie Borushko, Clerk, Carol Peistrack, Treasurer, JoAnn Swartz, Trustee, Matt Stawowy, Trustee, Dave Kroczaleski, Resident, Tim Hayley, Resident, Peter Shannon, Resident, Jo-Au Michalke, Resident, Ron Schub, Arenac County Heritage Route Authority, Jeff Trombley, Arenac County Drain Commission, Adam Kroczaleski, Arenac County Commissioner.

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

JoAnne Swartz reported that the township is a Red Cross emergency shelter. All board members may alternately attend the Hazard Mitigation meetings.

**Adams Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Thursday, February 9, 2017 @ 7 p.m.**

Attendees:

Sally Mrozinski, Clerk, Lisa Meihls, Treasurer, Mark Revord, Treasurer, Kevin McTaggart, Trustee, Sue Mrozinski, Resident, and Dawn Hergott, Arenac County Conservation District.

Don Hamilton, Lapham Associates.

Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan



was discussed and Mr. Hamilton indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

Probably over half of the township is forested. Almost all the cleared land is farmed. There are +/- 24 active oil and gas wells in the township. I75 and Old 76 pass through the northeast of the township. Creeks and drains rarely overflow (origins in the township).

**Standish Township  
Community Meeting Notes  
Arenac County Hazard Mitigation Plan  
Monday, February 13, 2017 @ 6 p.m.**

Attendees:

Robert North, Supervisor, Sue Kohn, Treasurer, Shara Klenk, Clerk, Roberta Lynch, Trustee, Julie Stackowski, Assessor, Greta Trudell, Resident, Carrie Stodolak, Resident, Debra Aguirre, Resident, Floyd Bendet, Resident, Jeanette Lemmer, Resident, Dorothy Deem, Resident, Anna Branda, Resident, Ronald Branda, Arenac County Commissioner, Mary Sammons, Secretary, Gary McFarland, Zoning Administrator, Laura Kandal, Resident, Sally Kandal, Resident, Chuck Laly, Resident, Rachel Farley, Resident, Floyd Reynolds, Resident, Erb Ridley, Resident, Ron Schwab, Resident., Chris Townley, Township Engineer. Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates. Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.

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James Hazeltine, Village President

Ed Rohn, Emergency Management Director and Don Hamilton, Lapham Associates.

Mr. Rohn provided information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the memorandum of Agreement.

The Village of Sterling is surrounded by farmland and oil/gas wells. The Village Infrastructure was discussed, revealing it is aged and in need of repairs.

Mr. Rohn and Mr. Hamilton passed out and discussed information regarding the Hazard Mitigation planning process the county has undertaken. The proposed schedule to complete the plan was discussed and Mr. Rohn indicated that township officials would be invited and welcome when the mitigation planning committee meets. The locations for the meetings have not been set. The group then went through and answered the questionnaire provided by Lapham Associates. Question number nine regarding specific hazard mitigation actions was left for further consideration by the group as well as the Memorandum of Agreement.